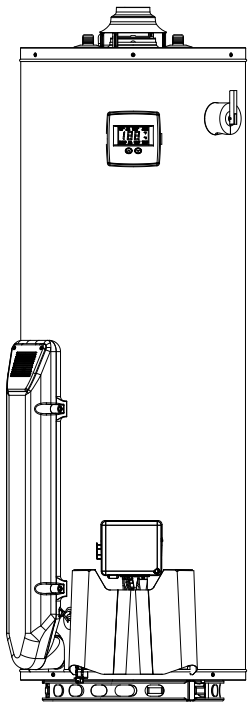
http://waterheatertimer.org/Review-AO-Smith-Effex-water-heater.html

SERVICE HANDBOOK FOR STANDARD RESIDENTIAL HIGH EFFICIENCY ATMOSPHERIC VENT (FVIR) GAS WATER HEATERS

MODELS:

GAHH 40 100,
GP 6 40YPC T 100,
PCG6240T403NOV 100,
PCG2J4040T3NOV 100,
12 40GPC T 100,
PCG2J4040T3NOV 100,

GAHH 50 100,
GP 6 50YPC T 100,
PCG250T403NOV 100,
PCG2J5040T3NOV 100,
12 50GPC T 100,
PCG2J5040T3NOV 100



Printed in U.S.A. 10/10

318181-000

ALL TECHNICAL AND WARRANTY QUESTIONS

SHOULD BE DIRECTED TO THE LOCAL DEALER FROM WHOM THE WATER HEATER WAS PURCHASED.
IF YOU ARE UNSUCCESSFUL, CONTACT A. O. SMITH WATER HEATERS RESIDENTIAL TECHNICAL ASSISTANCE AT 1-800-527-1953 OR WWW.HOTWATER.COM.

SERVICE HANDBOOK

Your safety and the safety of others is extremely important in the servicing of this water heater. Many safety-related messages and instructions have been provided in this handbook and on the water heater to warn you and others of a potential hazard. Read and obey all safety messages and instructions throughout this handbook. It is very important that the meaning of each safety message is understood by you and others who service this water heater.

The information contained in this handbook is designed to answer commonly faced situations encountered in the operation of the standard Residential Gas product line and is not meant to be all-inclusive. If you are experiencing a problem not covered in this handbook, please contact the Technical Information Center listed on the back of this handbook for further assistance. Additional information is also available on the web site listed on the back of this handbook. This handbook is intended for use by licensed plumbing professionals and reference should be made to the Installation Instructions and Use & Care Guide accompanying the product. This handbook contains supplemental information to the Installation Instructions and Use & Care Guide.

When servicing residential water heaters, it is essential that you return the unit to a safe condition before you leave the site. All original components must be re-installed and all safety measures must be implemented. In addition, the recommended water temperature setting is 120° F.

IMPORTANT: It is recommend that on every service call an inspection & cleaning of the air intake chamber screen and combustion chamber and air diverter assembly be performed. See page 24.

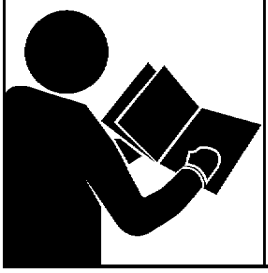
Tools Required (for servicing gas models):

- phillips head screw driver
- 3/8, 7/16, & 3/4 inch open end wrenches
- 3/16 inch Allen wrench
- 1-1/16 inch – 6 point – socket – for anode removal
- 5/16” nut driver
- pliers
- electrical multimeter (with alligator leads)
- digital or analog manometer
- gas pressure gauge
- Teflon® tape
- hose – to drain tank

Digital manometer shown.

Teflon® is a registered trademark of E.I. Du Pont De Numours and Company.

⚠ WARNING

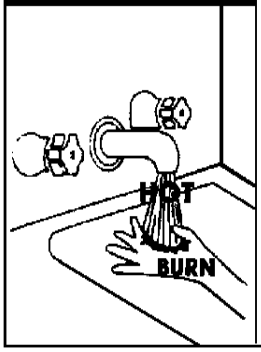


Read and understand instruction manual and safety messages before installing, operating or servicing this water heater.

Failure to follow instructions and safety messages could result in death or serious injury.

Instruction manual must remain with water heater.

⚠ DANGER



Water temperature over 125°F (52°C) can cause severe burns instantly resulting in severe injury or death.

Children, the elderly, and the physically or mentally disabled are at highest risk for scald injury.

Feel water before bathing or showering.

Temperature limiting valves are available.

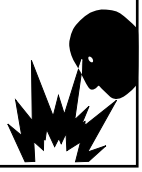
Read instruction manual for safe temperature setting.

⚠ WARNING

Fire or Explosion Harzard

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Avoid all ignition sources if you smell Natural or LP gas.
- Do not expose water heater control to excessive gas pressure.
- Use only gas shown on rating plate.
- Maintain required clearances to combustibles.
- Keep ignition sources away from faucets after extended period of non-use.

Read instruction manual before installing, using or servicing water heater.



⚠ WARNING

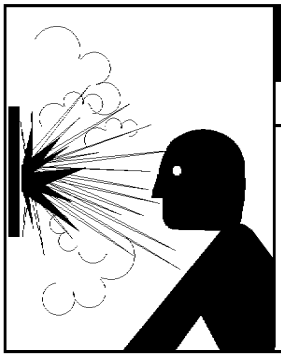
Fire Hazard

For continued protection against risk of fire:

- Do not install water heater on carpeted floor.
- Do not operate water heater if flood damaged.

⚠ WARNING

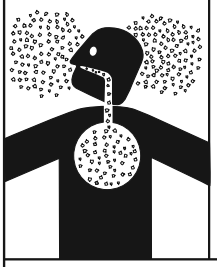
Explosion Hazard



- Overheated water can cause water tank explosion.
- Properly sized temperature and pressure relief valve must be installed in opening provided.

⚠ WARNING

Breathing Hazard - Carbon Monoxide Gas



- Install vent system in accordance with codes.
- Do not operate water heater if flood damaged
- Heater should not be installed for High Altitude operation above 10,100 feet (3,078 m).
- Do not operate if soot buildup.
- Do not obstruct water heater air intake with insulating jacket.
- Do not place chemical vapor emitting products near water heater.
- Gas and carbon monoxide detectors are available.

Breathing carbon monoxide can cause brain damage or death. Always read and understand instruction manual.

CAUTION

Improper installation and use may result in property damage.

- Do not operate water heater if flood damaged.
- Install in location with drainage.
- Fill tank with water before operation.
- Be alert for thermal expansion.

Refer to instruction manual for installation and service.

TABLE OF CONTENTS

INTRODUCTION:

Service Handbook Introduction 3
Warnings and Cautions 4
Table Of Contents 5

INSTALLATION / OPERATION:

Basic Installation & Operation 6
Combustion Air and Vent System Requirements 7-10

KNOW YOUR WATER HEATER:

Know the Water Heater's Component Parts 11-13
Water Heater Operation 14
Filling and Draining the Water Heater 15
Lighting Instructions 16

ADJUSTING TEMPERATURE CONTROL:

Adjusting the Temperature on the Electronic Control Display 17
Using the Electronic Control Display 18-19
Electronic Control Display Troubleshooting 20-23

COMPONENTS REMOVAL / REPLACING:

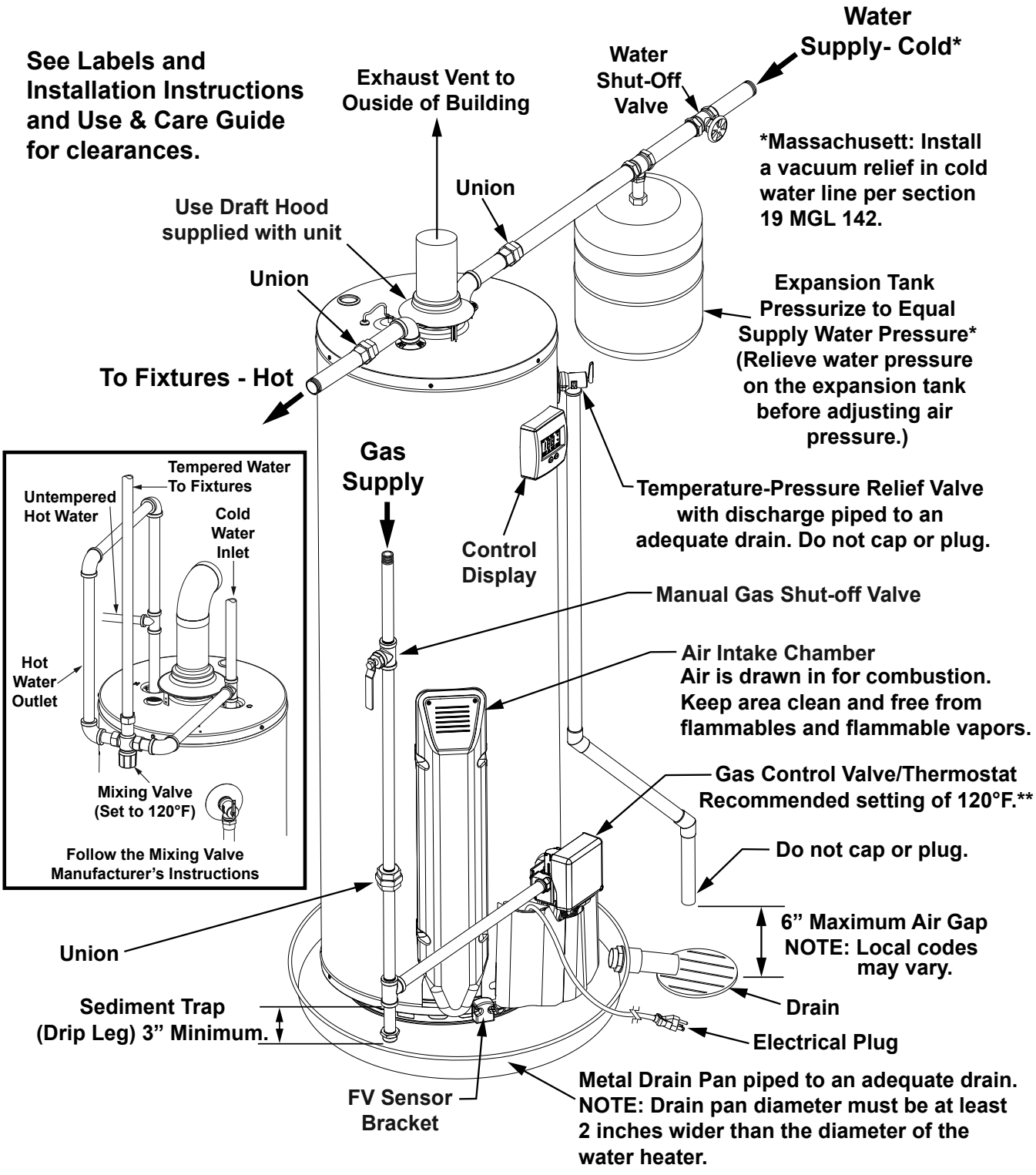
External Inspection and Cleaning 24
Electronic Control Display Removal / Replacement 25
Powered Anode Removal / Replacement 26-27
Pressure Switch Removal / Replacement 28
Transformer Removal / Replacement 29-30
Air Intake Chamber Box Removal / Replacement 31-33
Wiring Harnesss Removal / Replacement 34-36
Air Intake Chamber Fan Removal / Replacement 37-38
Pressure Tubing Removal / Replacement 39-40
Inner Door/Manifold/Burner Assembly Removal / Replacement 41-42
Flame Sense/Hot Surface Igniter Removal / Replacement 43
Burner Removal / Replacement 44-46
Burner Orifice Removal / Replacement 47-49
Gas Control Valve/Thermostat Removal / Replacement 50-52

CHECKPOINTS / GENERAL INFORMATION:

Checking the Gas Supply Pressure 52
Gas Water Heater Sizing Guide -and- Leakage Checkpoints 53
General Information 54-55

BASIC INSTALLATION & OPERATION

INSTALLATION OF RESIDENTIAL GAS WATER HEATER


See Labels and Installation Instructions and Use & Care Guide for clearances.
Exhaust Vent to Ouside of Building
Water Shut-Off Valve
Water Supply- Cold*
*Massachusett: Install a vacuum relief in cold water line per section 19 MGL 142.
Union
Use Draft Hood supplied with unit
Union
Expansion Tank Pressurize to Equal Supply Water Pressure* (Relieve water pressure on the expansion tank before adjusting air pressure.)
To Fixtures - Hot
Gas Supply
Tempered Water To Fixtures
Untempered Hot Water
Cold Water Inlet
Hot Water Outlet
Mixing Valve (Set to 120°F)
Follow the Mixing Valve Manufacturer's Instructions
Temperature-Pressure Relief Valve with discharge piped to an adequate drain. Do not cap or plug.
Control Display
Manual Gas Shut-off Valve
Air Intake Chamber
Air is drawn in for combustion. Keep area clean and free from flammables and flammable vapors.
Gas Control Valve/Thermostat
Recommended setting of 120°F.**
Do not cap or plug.
6" Maximum Air Gap
NOTE: Local codes may vary.
Union
Sediment Trap (Drip Leg) 3" Minimum.
Drain
Electrical Plug
FV Sensor Bracket
Metal Drain Pan piped to an adequate drain.
NOTE: Drain pan diameter must be at least 2 inches wider than the diameter of the water heater.

The water heater must be installed according to all local and state codes or in the absence of local and state codes, the "National Fuel Gas Code"' ANSI Z223.1(NFPA 54)- current edition.

*** NOTE: If on a well system the expansion tank should be set to the maximum pressure of the pump tank.**
**** White-Rodgers® gas control valve/thermostat shown in this figure.**

Figure 1

COMBUSTION AIR AND VENT SYSTEM REQUIREMENTS

Combustion Air Requirements:

⚠WARNING

Carbon Monoxide Warning

Water heater must be vented to outdoors.

Vent must be installed by a qualified technician using the local and state codes or, in the absence of local and state codes, the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) - current edition, and/or the installation instructions.

Examples of a qualified technican include: gas technicians, authorized gas company personel, and authorized service persons.

Failure to so do can result in death or carbon monoxide poisoning.

IMPORTANT: Air for combustion and ventilation must not come from a flammable or corrosive atmosphere. Any failure due to flammable or corrosive elements in the atmosphere is excluded from warranty coverage.

The following types of installation (not limited to the following) will require outdoor air for combustion due to chemical exposure and may reduce but not eliminate the presence of corrosive chemicals in the air:

- beauty shops
- photo processing labs
- buildings with indoor pools
- water heaters installed in laundry, hobby, or craft rooms
- water heaters installed near chemical storage areas
- water softeners

Combustion air must be free of acid-forming chemicals such as sulfur, fluorine, and chlorine. These elements are found in aerosol sprays, detergents, bleaches, cleaning solvents, air fresheners, paint, and varnish removers, refrigerants, and many other commercial and household products. When burned, vapors from these products form highly corrosive acid compounds. These products should not be stored or used near the water heater, air inlet, or air intake path.

Combustion and ventilation air requirements are determined by the location of the water heater. The water heater may be located in either an open (unconfined) area or in a confined area or small enclosure such as a closet or small room. Confined spaces are areas with less than 50 cubic feet for each 1,000 BTUH of the total input for all gas-using appliances.

Unconfined Space: A water heater in an unconfined space uses indoor air for combustion and requires at least 50 cubic feet for each 1,000 BTUH of the total input for all gas appliances. The table below shows a few examples of the minimum square footage (area) required for various BTUH inputs.

Table 1:

BTUH Input	Minimum Square Feet with 8' Ceiling	Typical Room with 8' Ceiling
30,000	188	9 x 21
45,000	281	14 x 20
60,000	375	15 x 25
75,000	469	15 x 31
90,000	563	20 x 28
105,000	657	20 x 33
120,000	750	25 x 30
135,000	844	28 x 30

IMPORTANT:

- The area must be open and be able to provide the proper air requirements to the water heater. Areas that are being used for storage or contain large objects may not be suitable for water heater installation.
- Water heaters installed in open spaces in buildings with unusually tight construction may still require outdoor air to function properly. In this situation, outside air openings should be sized the same as for a confined space.
- Modern home construction usually requires supplying outside air into the water heater area.
- Room exhaust fans may effect air requirements.

Confined Space: For the correct and proper operation of this water heater, ample air must be supplied for the combustion, ventilation, and dilution of flue gases. Small enclosures and confined areas must have two permanent openings so that sufficient fresh air can be drawn from outside of the enclosure. One opening shall be within 12 inches of the top and one within 12 inches of the bottom of the enclosure.

The size of each opening (free area) is determined by the total BTUH input of all gas utilization equipment (i.e., water heaters, furnaces, clothes dryers, etc.) and the method by which the air is provided. The BTUH input can be found on the water heater rating plate. Additional air can be provided by two methods:

1. All air from inside the building.
2. All air from outdoors.

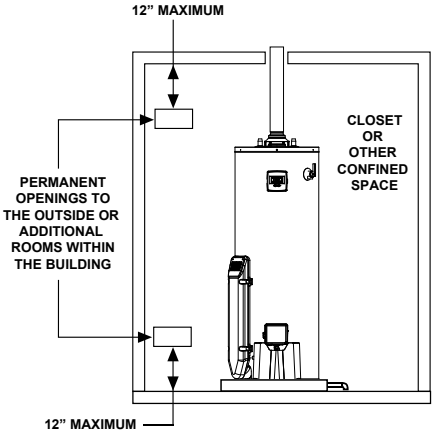

12" MAXIMUM
CLOSET OR OTHER CONFINED SPACE
PERMANENT OPENINGS TO THE OUTSIDE OR ADDITIONAL ROOMS WITHIN THE BUILDING
12" MAXIMUM

Figure 2.

COMBUSTION AIR AND VENT SYSTEM REQUIREMENTS

All Air from Inside the Building: When additional air is to be provided to the confined area from additional room(s) within the building, the total volume of the room(s) must be of sufficient size to properly provide the necessary amount of fresh air to the water heater and other gas utilization equipment in the area. Each of the two openings shall have a minimum free area of 1 square inch per 1,000 BTUH of the total input rating of all gas utilization equipment in the confined area, but not less than 100 square inches for each opening.

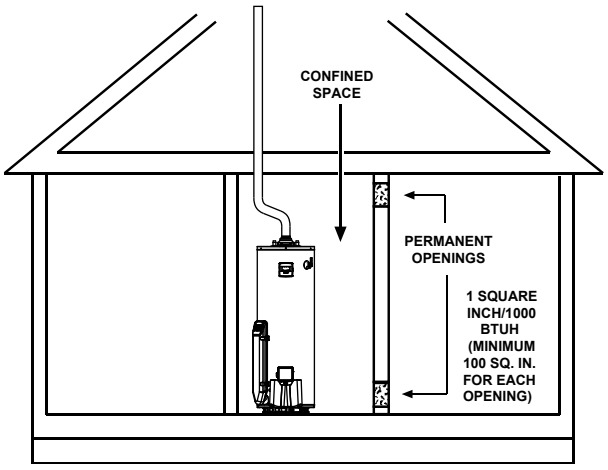


Figure 3.

All Air from Outdoors: Outdoor fresh air can be provided to a confined area either directly or by the use of vertical and horizontal ducts. The fresh air can be taken from the outdoors or from crawl or attic spaces that freely communicate with the outdoors. Attic or crawl spaces cannot be closed and must be properly ventilated to the outside. Ductwork must be of the same cross-sectional area as the free area of the opening to which they connect. The minimum dimension of rectangular air ducts cannot be less than three inches. The size of each of the two openings is determined by the method in which the air is to be provided. Refer to the table below to calculate the minimum free area for each opening.

Louvers and Grilles: In calculating free area for ventilation and combustion air supply openings, consideration must be given to the blocking effect of protection louvers, grilles, and screens. These devices can reduce airflow, which in turn may require larger openings to achieve the required minimum free area. Screens must not be smaller than 1/4" mesh. If the free area through a particular design of louver or grille is known, it should be used in calculating the specified free area of the opening. If the design and free area are not known, it can be assumed that most wood louvers will allow 20 - 25% of free area while metal louvers and grilles will allow 60 - 75% of free area. Louvers and grilles must be locked open or interconnected with the equipment so that they are opened automatically during equipment operation. Keep louvers and grilles clean and free of debris or other obstructions.

Minimum Free Area of Permanent Openings for Ventilation and Combustion Air Supply - All Air from Outdoors Only.

Based on total BTUH input rating for all utilizing equipment within the confined space.

Opening Source	Minimum Free Area Per Opening (sq. in.)	Reference Drawing
*Direct to outdoors	1 sq. in, per 4000 BTUH	Figure 4
Vertical Ducts	1 sq. in, per 4000 BTUH	Figure 5
Horizontal Ducts	1 sq. in, per 2000 BTUH	Figure 6
Single Opening	1 sq. in, per 3000 BTUH	Figure 7

Example: A water heater with an input rating of 50,000 BTUH using horizontal ducts would require each opening to have a minimum free area of 25 square inches.

Minimum free area = 50,000 BTUH x 1 sq. in. / 2000 BTUH = 25 sq. in.

* These openings connect directly with the outdoors through a ventilated attic, a ventilated crawl space, or through an outside wall.

Consult the local codes of your area for specific ventilation and combustion air requirements

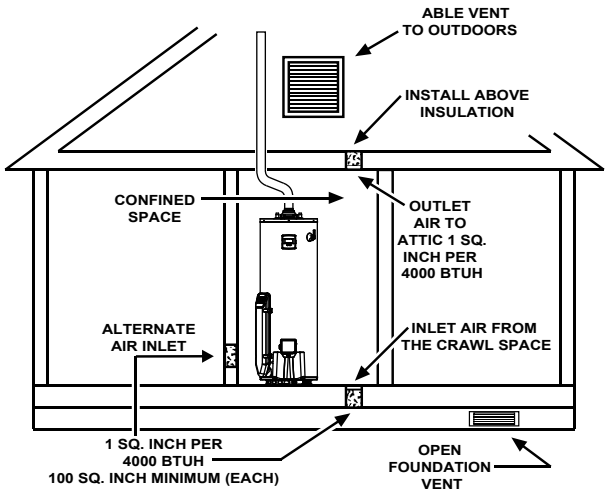

ABLE VENT TO OUTDOORS
INSTALL ABOVE INSULATION
CONFINED SPACE
OUTLET AIR TO ATTIC 1 SQ. INCH PER 4000 BTUH
ALTERNATE AIR INLET
INLET AIR FROM THE CRAWL SPACE
1 SQ. INCH PER 4000 BTUH
100 SQ. INCH MINIMUM (EACH)
OPEN FOUNDATION VENT
ALL AIR FROM OUTDOORS: INLET AIR FROM VENTILATED CRAWL SPACE/OUTLET AIR TO VENTILATED ATTIC

Figure 4.

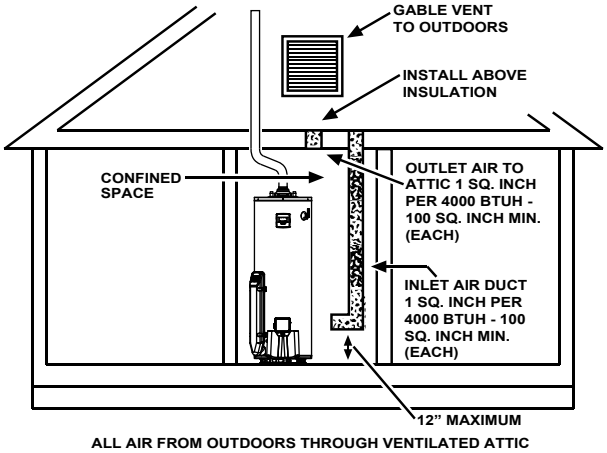

GABLE VENT TO OUTDOORS
INSTALL ABOVE INSULATION
CONFINED SPACE
OUTLET AIR TO ATTIC 1 SQ. INCH PER 4000 BTUH - 100 SQ. INCH MIN. (EACH)
INLET AIR DUCT 1 SQ. INCH PER 4000 BTUH - 100 SQ. INCH MIN. (EACH)
12" MAXIMUM
ALL AIR FROM OUTDOORS THROUGH VENTILATED ATTIC

Figure 5.

COMBUSTION AIR AND VENT SYSTEM REQUIREMENTS

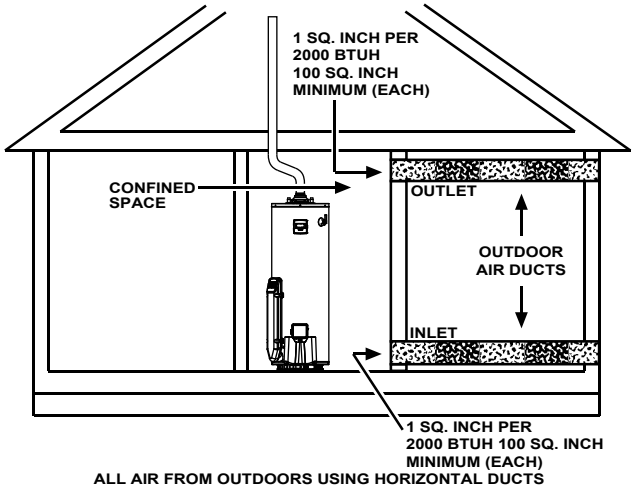


Figure 6.

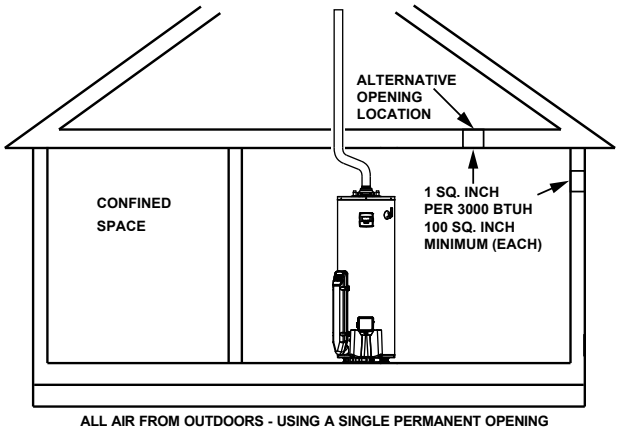


Figure 7.

Vent Pipe System: This water heater must be properly vented for the removal of exhaust gases to the outside atmosphere. Correct installation of the vent pipe system is mandatory for the proper and efficient operation of this water heater and is an important factor in the life of the unit.

The vent pipe must be installed according to all local and state codes or, in the absence of local and state codes, the “National Fuel Gas Code”, ANSI Z223.1(NFPA 54)-current edition. The vent pipe installation must not be obstructed so as to prevent the removal of exhaust gases to the outside atmosphere.

U.L. recognized fuel gas and carbon monoxide (CO) detectors are recommended in all applications and should be installed using the manufacturer’s instructions and local codes, rules, or regulations.

Vent Pipe Size: It is important that you follow the guidelines in these instructions for sizing a vent pipe system. If a transition to a larger vent size is required, the vent transition connection must be made at the draft hood outlet. DO NOT reduce the vent size to less than the draft hood outlet diameter.

Vent Connectors:

1. Type B, Double wall, U.L. Listed Vent Pipe.
2. Single wall Vent Pipe.

Maintain the manufacturer’s specified minimum clearance from combustible materials when using type B double wall vent pipe.

Vent connectors made of type B, double wall vent pipe material may pass through walls or partitions constructed of combustible material if the minimum listed clearance is maintained.

Maintain a one inch minimum clearance from all combustible materials when using single wall vent pipe.

IMPORTANT: Single wall vent pipe cannot be used for water heaters located in attics and may not pass through attic spaces, crawl spaces or any confined or inaccessible location. A single wall metal vent connector cannot pass through any interior wall.

When installing a vent connector, please note the following

- Install the vent connector avoiding unnecessary bends, which create resistance to the flow of vent gases.
- Install without dips or sags with an upward slope of at least 1/4-inch per foot.
- Joints must be fastened by sheet metal screws or other approved means. It must be supported to maintain clearances and prevent separation of joints and damage.
- The length of the vent connector cannot exceed 75% of the vertical vent height.
- The vent connector must be accessible for cleaning, inspection, and replacement.
- Vent connectors cannot pass through any ceiling, floor, firewall, or fire partition.
- It is recommended (but not mandatory) that a minimum 12 inches of vertical vent pipe be installed on the draft hood prior to any elbow in the vent system.

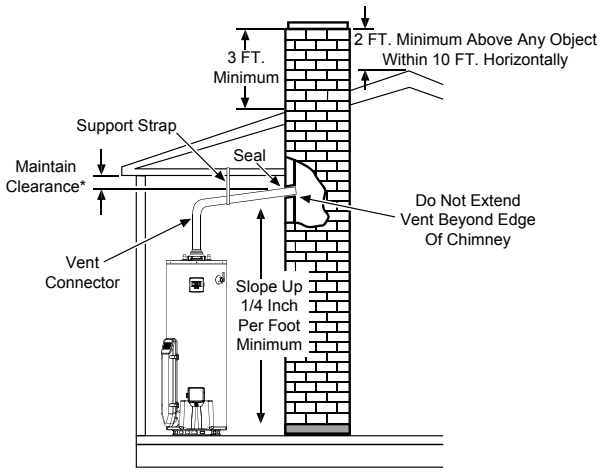
IMPORTANT: Existing vent systems must be inspected for obstructions, corrosion, and proper installation.

Chimney Connection: IMPORTANT: Before connecting a gas vent to a chimney, make sure the chimney passageway is clear and free of obstructions. The chimney must be cleaned if previously used for venting solid fuel appliances or fireplaces. Also consult local and state codes for proper chimney sizing and application or, in the absence of local and state codes, the “National Fuel Gas Code”, ANSI Z223.1(NFPA 54)-current edition.

- The connector must be installed above the extreme bottom of the chimney to prevent potentially blocking the flue gases.

COMBUSTION AIR AND VENT SYSTEM REQUIREMENTS

- The connector must be firmly attached and sealed to prevent it from falling out.
- To aid in removing the connector, a thimble or slip joint may be used.
- The connector must not extend beyond the inner edge of the chimney as it may restrict the space between it and the opposite wall of the chimney


2 FT. Minimum Above Any Object Within 10 FT. Horizontally
3 FT. Minimum
Support Strap
Maintain Clearance*
Seal
Do Not Extend Vent Beyond Edge Of Chimney
Vent Connector
Slope Up 1/4 Inch Per Foot Minimum

Chimney Termination Vent System

Figure 8.

Do not reduce the vent to less than the draft hood outlet diameter. Do not terminate the vent connector in a chimney that has not been certified for this purpose. Some local codes may prohibit the termination of vent connectors in a masonry chimney.

Vertical Exhaust Gas Vent: Vertical exhaust gas vents must be installed with U.L. listed type B vent pipe according to the vent manufacturer's instructions and the terms of its listing.

It must be connected to the water heater's draft hood by a listed vent connector or by directly originating at the draft hood opening.

Vertical gas vents must terminate with a listed cap or other roof assembly and be installed according to their manufacturer's instructions.

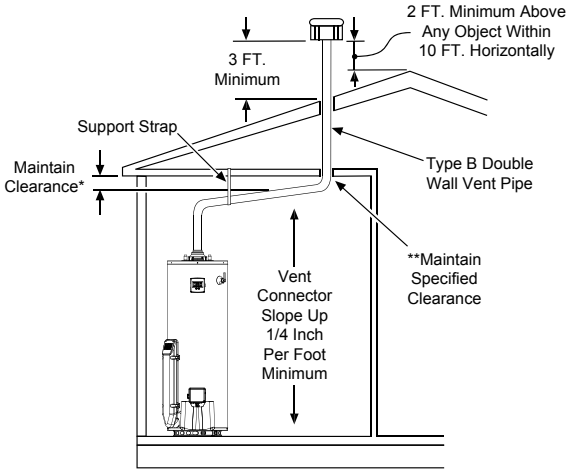
Gas vents must be supported to prevent damage, joint separation, and maintain clearances to combustible materials.

IMPORTANT: This gas vent must be terminated in a vertical position to facilitate the removal of the burnt gases.

An unused chimney flue or masonry enclosure may be used as a passageway for the installation of a gas vent. NOTE: The chimney flue or masonry enclosure size may be too large to allow proper venting.

Common (combined) venting is allowable with vertical type B vent systems and lined masonry chimneys as long as proper draft for the water heater is established under all conditions of operation. CAUTION: DO NOT common vent this water heater with any power vented appliance.

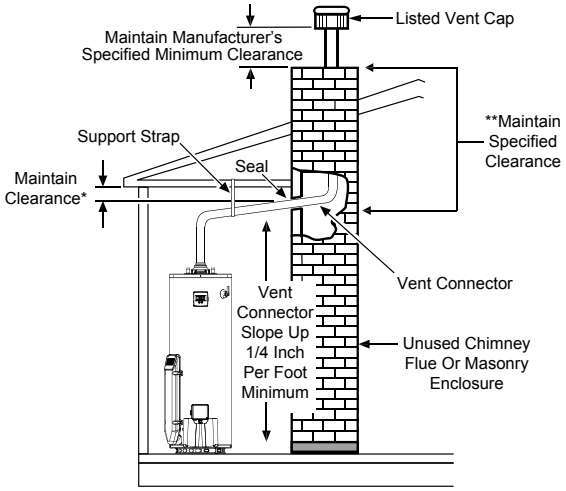
The following figures are examples of vent pipe system installations and may or may not be typical for your specific application. Consult the "National Fuel Gas Code", NFPA 54, ANSI Z223.1-current edition and the guidelines set forth by prevailing local codes.


2 FT. Minimum Above Any Object Within 10 FT. Horizontally
3 FT. Minimum
Support Strap
Maintain Clearance*
Type B Double Wall Vent Pipe
**Maintain Specified Clearance
Vent Connector Slope Up 1/4 Inch Per Foot Minimum

Venting Gas Vent System With Type B Double Wall Vent Pipe.

Figure 9.

Consult the table found in the "National Fuel Gas Code", NFPA 54, ANSI Z223.1-current edition to determine the minimum height from roof to lowest discharge opening.



Venting Through Chimney With Type B Double Wall Vent Pipe.

Figure 10.

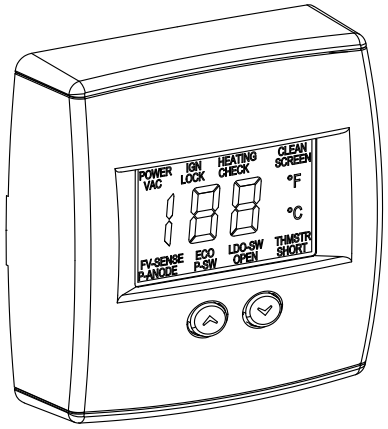
* Maintain vent pipe clearance requirements to local, state and/or the "National Fuel Gas Code", ANSI Z223.1(NFPA 54)-current edition.

** NFPA 211, Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances states that these chimneys are intended to be installed in accordance with the installation instructions provided with each chimney support assembly. Minimum air space clearance to combustible materials should be maintained as marked on the chimney sections.

KNOW THE WATER HEATER'S COMPONENT PARTS

Electronic Control Display (Upper Control)
The Electronic Control Display panel used on this water heater provides an easy-to-read, eye level display for temperature adjustment, fault code diagnostics and recall, powered anode rod operation and setting the temperature scale for either Fahrenheit (°F) or Celsius (°C).

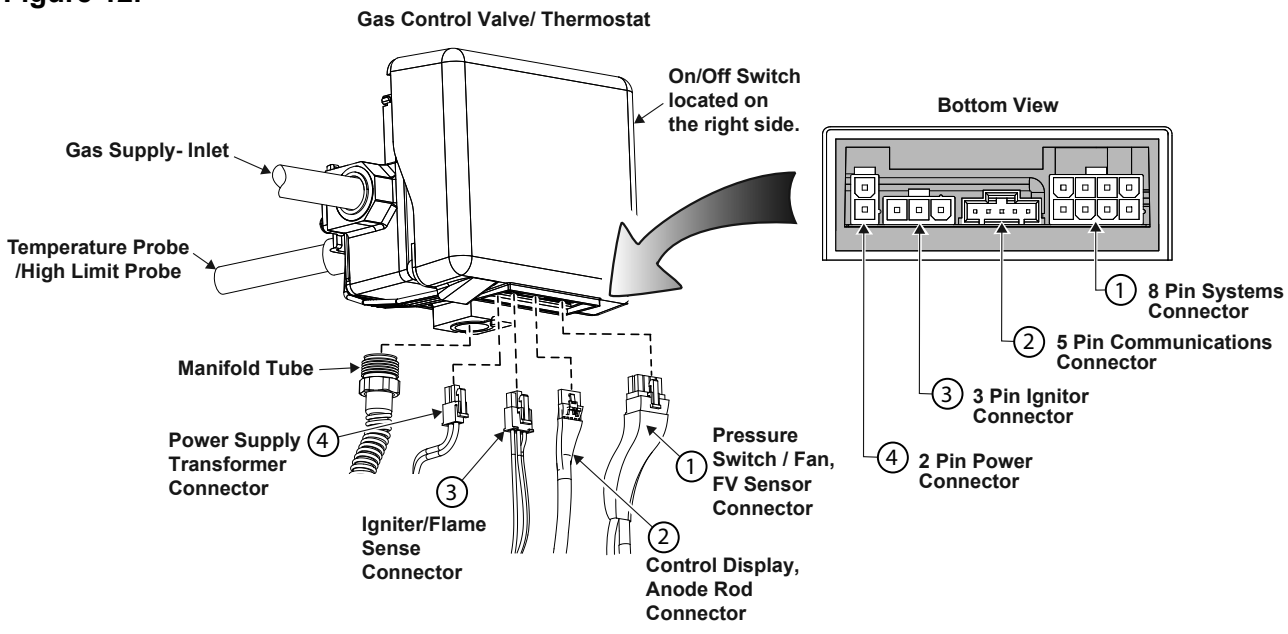
Figure 11.



Electronic Control Display
(Upper Control)

Gas Control Valve/Thermostat (Lower Control)
The gas control valve/thermostat is where the incoming gas supply is connected to the water heater. It is used in conjunction with the electronic control display to start or stop main burner operation. There is an On/Off switch located on the right-hand side of the control. The gas control valve/thermostat is energized by a **24 VAC power supply transformer** and uses a temperature sensing probe to open or close the flow of gas to the main burner. The gas control valve has an inlet filter built into its body to prevent impurities in the gas system from contaminating the internal valves and a LED diagnostic light located in the lower right hand corner of the valve to display any micro-computer fault experienced by the control. On the bottom of the control is where electrical connections to the other component parts are attached along with the gas supply (manifold tube) to the main burner. The gas control/valve thermostat of this water heater is suitable for use on Natural gas only.

Figure 12.

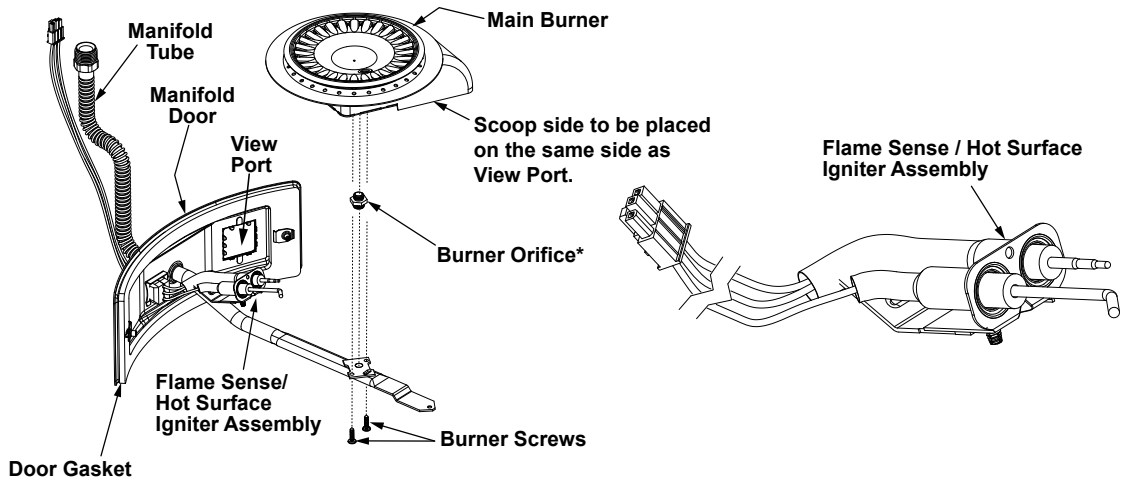


KNOW THE WATER HEATER'S COMPONENT PARTS

Burner/Manifold Door Assembly

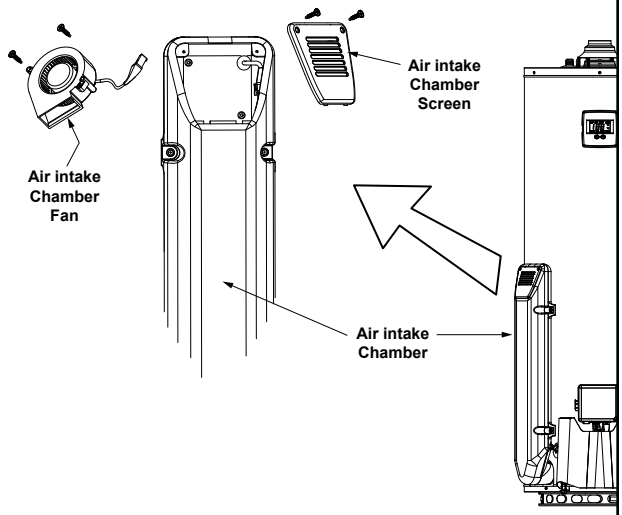
The burner/manifold door assembly consists of several components such as: main burner, burner orifice, manifold tube and flame sense / hot surface igniter. See figure below for the complete list of components (Figure 13).

Figure 13.



*DO NOT operate the water heater without the burner orifices installed.

Figure 14.



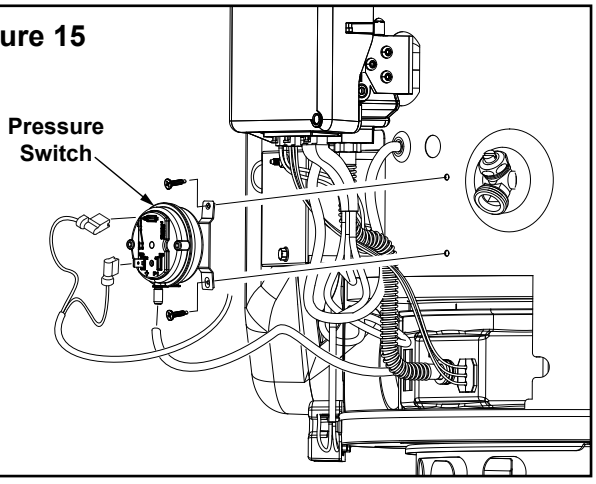
Air Intake Chamber Fan

The small fan at the top of the air intake chamber on the side of the water heater is used to draw in necessary combustion air for the efficient operation of the main burner. The fan pressurizes the sealed combustion chamber which in turn allows the **flue baffle** inside the center flue tube to slow down the hot exhaust gases so heat can be extracted into the water before exiting into the vent system. The air intake chamber fan runs for about 5 seconds to pre-purge the combustion chamber before the beginning of an ignition sequence when there is a call for heat. The fan will continue to operate while the main burner is in operation and for about 5 seconds after the temperature set point has been achieved. The **air intake chamber screen** covering the fan should be inspected and cleaned periodically to assure it is not limiting air flow into the chamber (Figure 14).

Pressure Switch

A pressure switch in the control string of this water heater is used to verify there is an adequate flow of combustion air into the combustion chamber before and during main burner operation. It is electrically connected to the gas control valve/thermostat and controls the opening and closing of the gas valve. If there is an insufficient air supply being delivered to the combustion chamber the pressure switch will not allow the water heater to operate (Figure 15).

Figure 15



KNOW THE WATER HEATER'S COMPONENT PARTS

Flammable Vapor Cut Off Switch (FV Sensor)
The water heater is equipped with a FV sensor, for detecting the presence of flammable vapors (e.g. spilled gasoline). When the sensor detects those vapors, the heater will shut down and not operate. If flammable vapors are detected or the sensor is inoperative, an icon will flash on the electronic control display and the heater will go into a lockout mode. The water heater will not function again until the flammable vapors have been eliminated and the control is manually reset using a special Flammable Vapor sensor reset sequence. (Figure 16).

Figure 16.

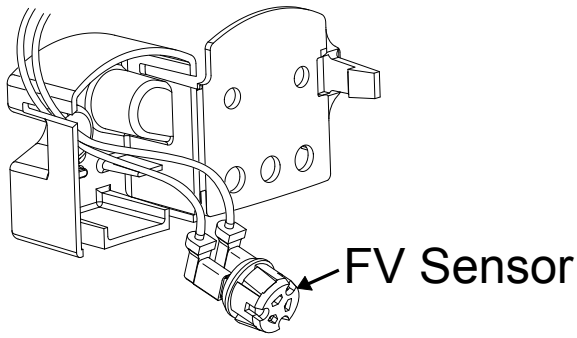
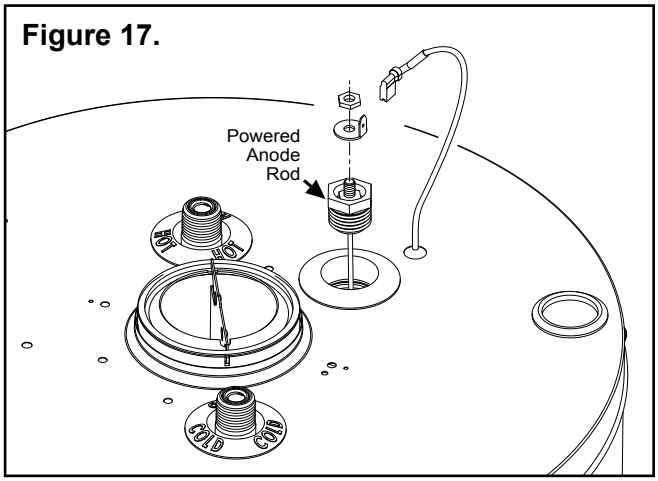


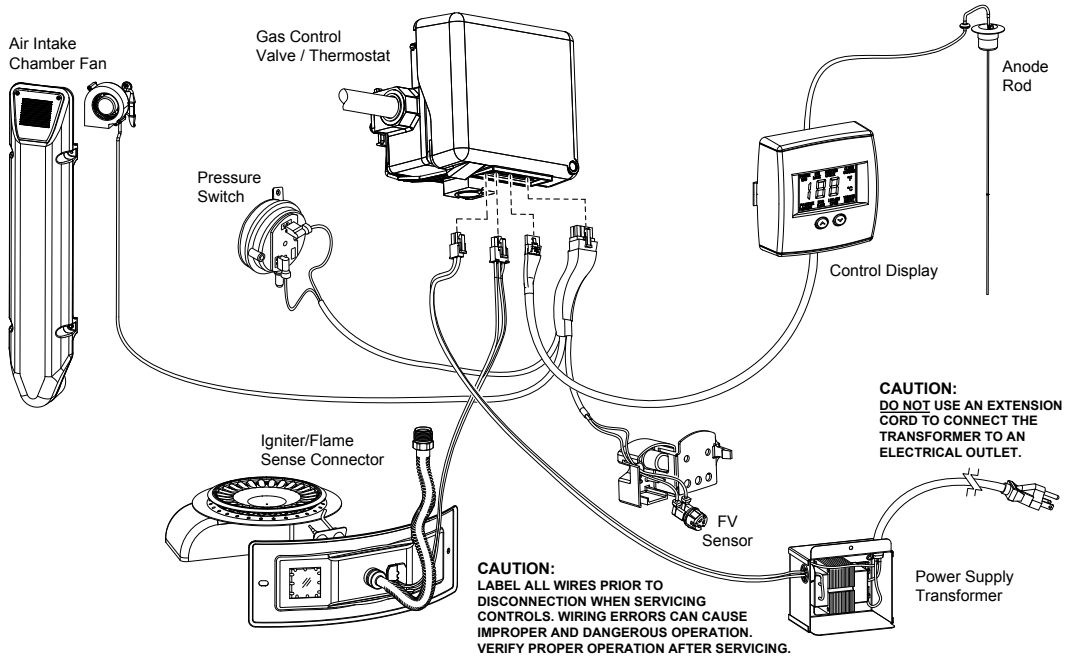
Figure 17.



Power Anode Rod
To protect the glass-lined water tank from corrosion through electrolysis, this water heater is equipped with a non sacrificial powered anode rod. Unlike conventional magnesium or aluminum anode rods used in water heaters, the powered anode does not deteriorate and is less likely to contribute to the occurrence of "Smelly (Rotten Egg) Water" (Figure 17).

HOW THE WATER HEATER'S COMPONENT PARTS ARE CONNECTED

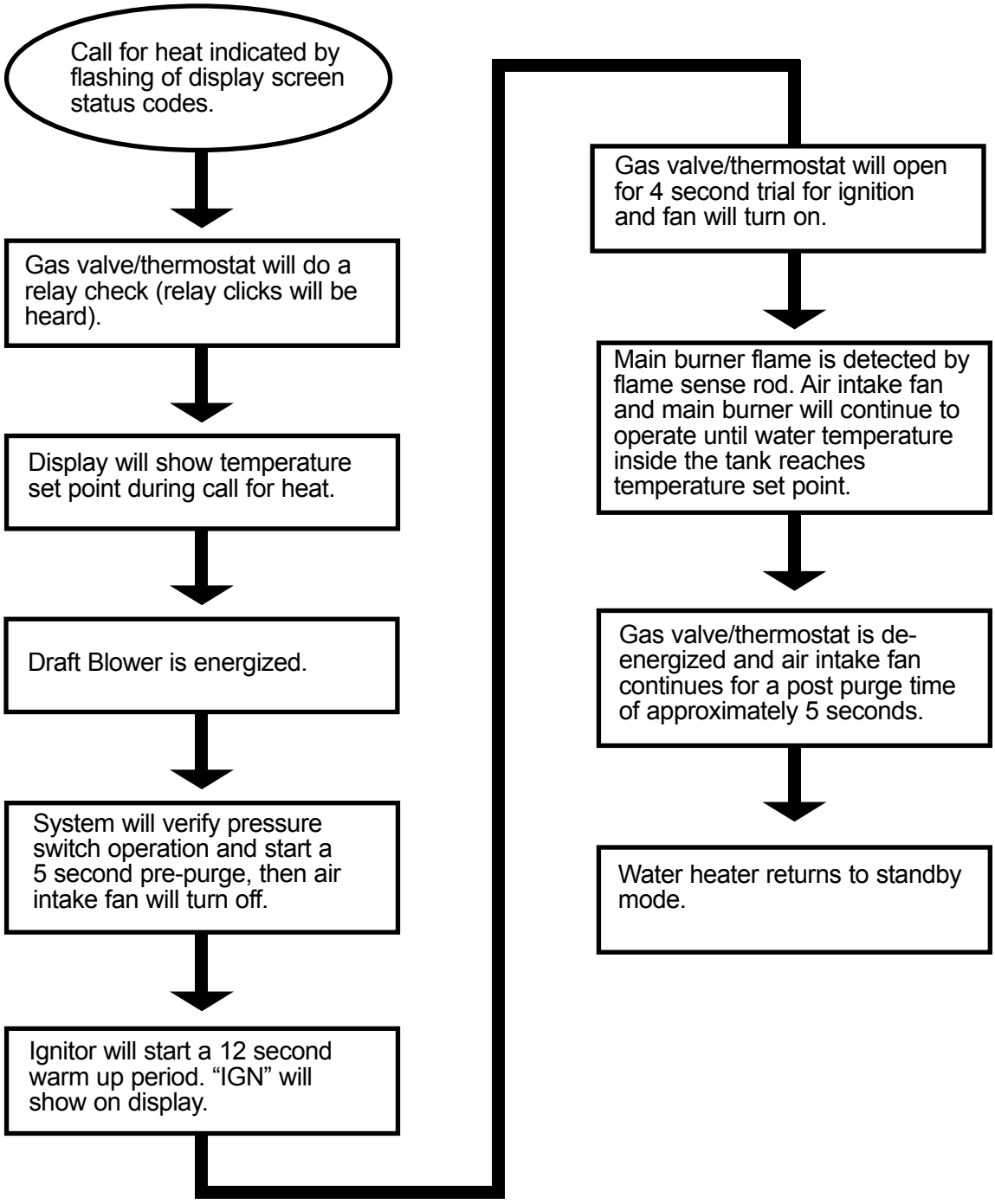
Figure 18.



WATER HEATER OPERATION

The figure below shows the water heater's sequence of operation when a call for heat is initiated. The gas control valve/thermostat will attempt to light the burner three times. If the flame sense rod in the burner/ manifold assembly does not detect ignition, the control will enter lockout mode indicated by the electronic control display's flashing of the appropriate status code.

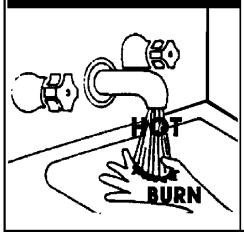
SEQUENCE OF OPERATION


Call for heat indicated by flashing of display screen status codes.
Gas valve/thermostat will do a relay check (relay clicks will be heard).
Display will show temperature set point during call for heat.
Draft Blower is energized.
System will verify pressure switch operation and start a 5 second pre-purge, then air intake fan will turn off.
Ignitor will start a 12 second warm up period. "IGN" will show on display.
Gas valve/thermostat will open for 4 second trial for ignition and fan will turn on.
Main burner flame is detected by flame sense rod. Air intake fan and main burner will continue to operate until water temperature inside the tank reaches temperature set point.
Gas valve/thermostat is de-energized and air intake fan continues for a post purge time of approximately 5 seconds.
Water heater returns to standby mode.

FILLING, DRAINING AND FLUSHING THE WATER HEATER TANK

It is recommended that the tank be drained and flushed every 6 months to remove sediment which may build up during operation. The water heater should be drained if being shut down during freezing temperatures. To drain the tank, perform the following steps:

⚠ DANGER



- Hot water discharge burn hazard.
- Keep clear of relief valve discharge unit.
- Temperature limiting valves are available.
- Read instruction manual for safe temperature setting.

CAUTION

Improper installation and use may result in property damage.

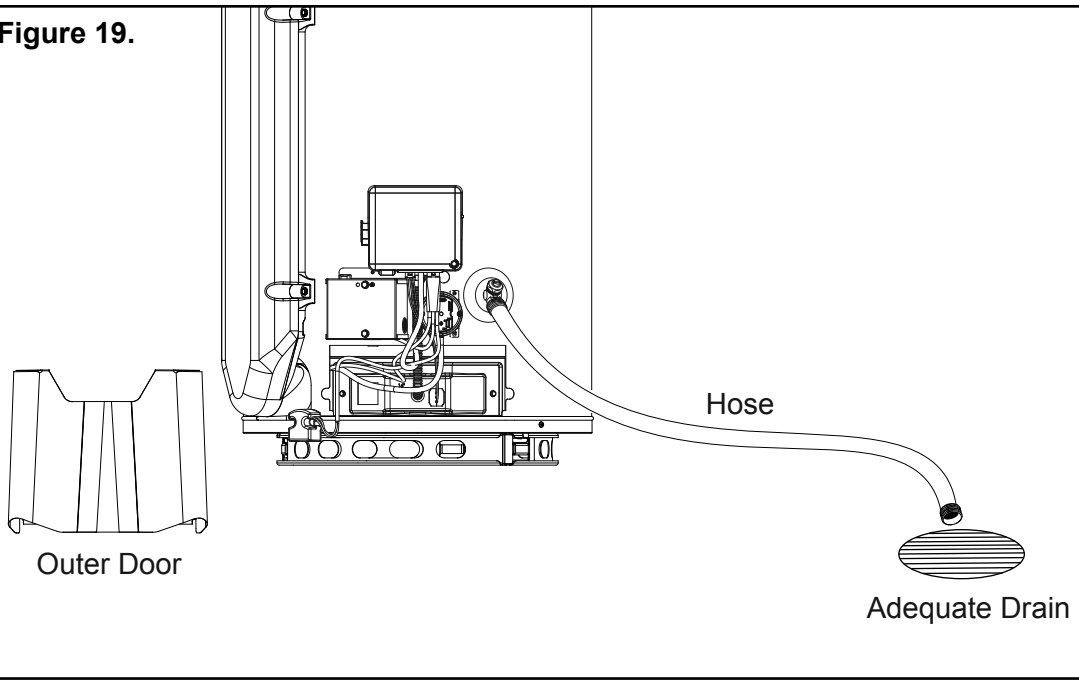
- Fill tank with water before operation.

1. Turn off the gas to the water heater at the manual gas shut-off valve and turn off the electrical power to the gas control/thermostat valve.
2. Open a nearby hot water faucet until the water is no longer hot.
3. Close the cold water inlet valve.
4. Remove the outer door and connect a hose to the drain valve and terminate it to an adequate drain or external to the building (Figure 19).
5. Open the water heater drain valve and allow all the water to drain from the tank. Flush the tank with water as needed to remove sediment.
6. Close the drain valve, refill the tank, and restart the heater as directed in the lighting instructions on the front of the heater.

IMPORTANT: Condensation may occur when refilling the tank and should not be confused with a tank leak.

NOTE: If the water heater is going to be shut down for an extended period, the drain valve should be left open.

Figure 19.



LIGHTING INSTRUCTIONS

Read and understand these directions thoroughly before attempting to operate the water heater. Make sure the view port is not missing or damaged. Make sure the tank is completely filled with water before operating the water heater. The gas control valve/thermostat has an “On/Off Switch” and needs to be turned on before the water heater is operational. Check the label on the front of the water heater near the gas control valve/thermostat for the correct gas. Do not start this water heater with any gas other than the one listed on the label. If you have any questions or doubts, consult the gas supplier or gas utility company. The following Lighting Instruction label appears on the front of the water heater.

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

FLAMMABLE

BEFORE OPERATING: ENTIRE SYSTEM MUST BE FILLED WITH WATER AND AIR PURGED FROM ALL LINES.

A. This appliance does not have a pilot. It is equipped with an ignition device that will automatically light the burner. Do not try to light the burner by hand.

B. **BEFORE OPERATING** smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

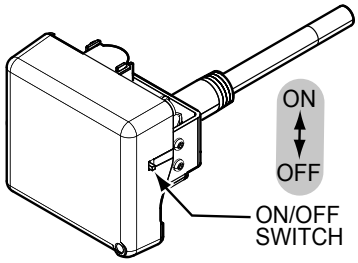
WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor’s phone. Follow the gas supplier’s instructions.
- If you cannot reach your gas supplier, call the fire department.

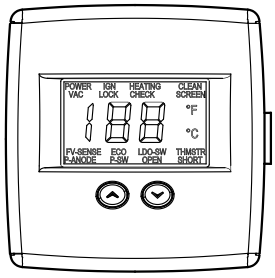
C. Use only your hand to push in the electronic display buttons and gas control switch. Never use tools. If the control buttons will not push in, don't try to repair them, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

D. Do not use this appliance if any part has been under water. Immediately contact a qualified installer or service agency to replace a flooded water heater. Do not attempt to repair the unit. It must be replaced!

OPERATING INSTRUCTIONS



"GAS CONTROL"



"ELECTRONIC DISPLAY"

1. STOP! Read the safety information above on the label.
2. Turn on all electrical power to the appliance.
3. Set the ON/OFF switch on the gas control to the "ON" position.
4. Set the Electronic Display to the lowest setting by first pressing the COOLER ⌄ and HOTTER ⌃ buttons together and holding for 1 second. Then press the COOLER ⌄ button to the lowest setting.
5. Set the ON/OFF switch on the gas control to the "OFF" position.
6. This appliance is equipped with a device which automatically lights the burner. **DO NOT TRY TO LIGHT THE BURNER BY HAND.**
7. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to the next step.
8. Set the ON/OFF switch on the gas control to the "ON" postition.
9. Set the Electronic Display to the desired setting by first pressing the COOLER ⌄ and HOTTER ⌃ buttons together and holding for 1 second. Then press the HOTTER ⌃ button until the desired setting is reached.

DANGER: Hotter water increases the risk of scald injury. Consult the instruction manual before changing temperature.

10. If the appliance will not operate, follow the instructions "TO TURN OFF GAS TO APPLIANCE" and call your technician or gas supplier.

WARNING: TURN OFF ALL ELECTRIC POWER BEFORE SERVICING.

TO TURN OFF GAS TO APPLIANCE

1. Set the Electronic Display to the lowest setting by first pressing the COOLER ⌄ and HOTTER ⌃ buttons together and holding for 1 second. Then press the COOLER ⌄ button to the lowest setting.
2. Set the ON/OFF switch on the gas control to the "OFF" postition.
3. Turn off all electrical power to the appliance if service is to be performed.

Figure 20.

ADJUSTING THE TEMPERATURE ON THE ELECTRONIC CONTROL DISPLAY

Adjusting the Temperature Set Point - The thermostat of this water heater has been factory set at its lowest position. It is adjustable and must be reset to the desired temperature setting to reduce the risk of scald injury. The electronic control display temperature should be set at approximately 120°F (49°C) and this is the preferred starting point, see Figure 21 Some states have a requirement for a lower setting. If you need hotter water, follow directions for temperature adjustment, but beware of the warnings in this section.

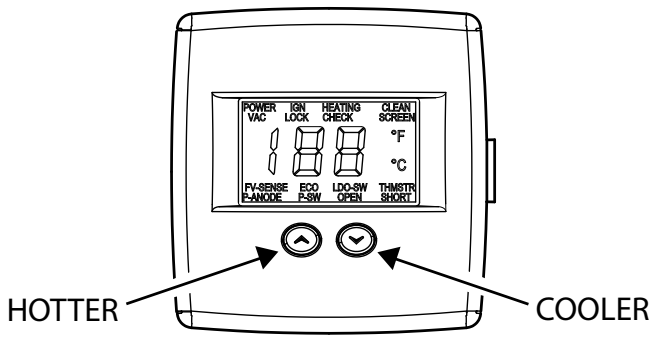
Pressing the "COOLER" ⓥ button decreases temperature and pressing the "HOTTER" ⓐ button increases the temperature.

To avoid any unintentional changes in water temperature settings, the control has a tamper resistant feature for changing the temperature setting. To change the temperature setting follow these instructions:

1. "Unlock" the temperature indicators by holding down both "COOLER" and "HOTTER" temperature adjustment buttons at the same time for one second (See Figure 21). The temperature indicators will light up and will only remain on for 30 seconds if no further buttons are pressed. After 30 seconds the control will go back to "Lock" mode ("Lock" mode indicates a temperature setting is locked into the control memory).
2. Release both of the temperature adjustment buttons.
   A. To decrease the temperature press and release the "COOLER" ⓥ button until the desired setting is reached.
   B. To increase the temperature press and release the "HOTTER" ⓐ button until the desired setting is reached.

NOTE: Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the heater.

Figure 21. Gas Control Valve/Thermostat Settings



Electronic Control Display

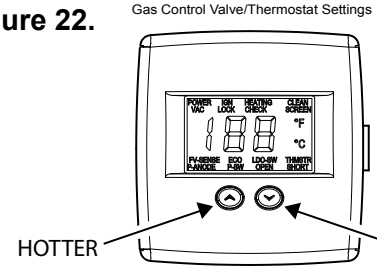
Water Temperature °F	Time for 1st Degree Burn (Less Severe Burns)	Time for Permanent Burns 2nd & 3rd Degree (Most Severe Burns)
110	(normal shower temp.)	
116	(pain threshold)	
116	35 minutes	45 minutes
122	1 minute	5 minutes
131	5 seconds	25 seconds
140	2 seconds	5 seconds
149	1 second	2 seconds
154	instantaneous	1 second
(U.S. Government Memorandum, C.P.S.C., Peter L. Armstrong, Sept. 15,1978)		

Table 2

USING THE ELECTRONIC CONTROL DISPLAY

How to select or change the temperature scale from Fahrenheit (°F) to Celsius (°C).

Figure 22. Gas Control Valve/Thermostat Settings



Electronic Control Display

1. The temperature scale defaults to Fahrenheit (°F).
2. To change to Celsius (°C), press the two temperature adjustment buttons at the same time for more than five (5) seconds but less than 10 seconds to enter the Temperature Scale Selection mode. In this mode the currently active temperature scale indicator (°F or °C) will start to flash. When in this mode a button press of either the red up arrow, or the blue down arrow button will cause the control to toggle the temperature scale between °F and °C (Figure 22).
3. Once the selection has been made the user may exit this mode by again pressing the two temperature adjustment buttons at the same time for more than two (2) seconds but less than five (5) seconds. The control will also time out five (5) seconds after the last button press and return to the normal operational mode.

Fault Code Diagnostics:

- The control system of this water heater monitors inputs and outputs.
- When the system determines a fault condition is present it will show the fault on the display.
- Depending on the fault, the system may continue to operate or enter a timed lockout.
- Lockout time varies depending on the fault.
- When the lockout time expires, if the fault has been corrected, the system will attempt normal operation.

Fault Code Retrieval:

- The system will display the last eight (8) fault codes.
- The system will display how many days ago each fault occurred, up to 14 days. Note: A “14” indicates that the fault occurred 14 or more days ago. Interrupting the power restarts the date code at “00”.
- User must enter *Field Service Mode* to view information.
- Current water temperature, measured at gas valve/thermostat will also be displayed in *Field Service mode.*

Entering *Field Service Mode*:

1. Press and hold both temperature adjust buttons (Figure 22).
2. Hold both buttons as control passes from the set point display to Temperature Scale Selection menu. Continue to hold buttons until “CHECK” icon is displayed, then release buttons. This will take 10 to 15 seconds.
3. The display will show the current water temperature, “POWER” icon, “CHECK” icon and will flash any current fault icons. The backlight will always be displayed while in the *Field Service Mode.*

USING THE ELECTRONIC CONTROL DISPLAY

Reviewing Fault Codes:

1. Press the red up arrow button one time.
2. The display will show either E0 or E1.
3. If E0 is shown, there are no faults. By pressing the up arrow button again the display will exit the *Field Service mode,* or the control will exit automatically after no button is pressed for five (5) seconds.
4. If E1 is shown, the control will flash the icons of the most recent fault.
5. Pressing the red up arrow button again will shown how many days ago the fault occurred and continue to flash the corresponding fault icons.
6. Interpreting the day of the fault occurrence is as follows...00 would be today, 01 would be yesterday, up to 14 which would be 14 or more days ago.
7. Continuing to press the up arrow button will scroll through all of the eight (8) most recent faults, if they exist, and its days ago of occurrence.
8. After the last fault is reached the display will return to the first fault (E1) to allow for the faults to be reviewed again.

Exiting *Field Service Mode*:

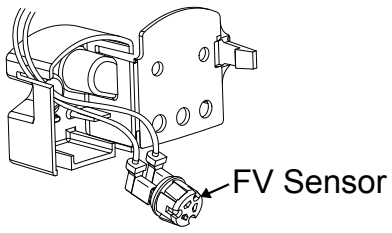
- There are three (3) methods to exit the Field Service Mode, Manual, Manual and Clear, and Timed Exit.

1. Manual exit is accomplished by pressing both the red up arrow and the blue down arrow buttons for one (1) second, but less than five (5) seconds while in the *Field Service Mode,* or by pressing the red up arrow button one (1) time after the “E0” is displayed during fault review while in the *Field Service Mode.* These methods will return the control to the standard operating mode and retain any fault codes stored in memory.
2. Manual exit and fault clear is accomplished by pressing the red up arrow and the blue down arrow buttons for five (5) seconds while in the *Field Service Mode.* This method will return the control to the standard operating mode and at the end of the five (5) seconds clear all faults stored in memory and initiate a software reset indicated by all the LCD segments coming on for five (5) seconds. The temperature setting and scale, etc. will not be altered using this method of exit.
3. Timed exit will occur while in the *Field Service Mode* if the control detects no button presses for a period exceeding five (5) minutes. The control will automatically return to the normal operating mode and keep all fault data retained in memory.

FV-Sense Reset Sequence:

Flammable liquids (such as gasoline, solvents, adhesives, LP gases, etc.) and other substances emit flammable vapors which can be ignited by a gas water heater’s hot surface igniter or main burner. The resulting flashback and fire can cause serious burns to anyone in the area. This water heater is equipped with a FV sensor for detecting the presence of flammable vapors. When the sensor detects those vapors, the unit will shut down and not operate. Even though this water heater is a flammable vapors ignition resistant water heater and designed to reduce the chances of flammable vapors being ignited, gasoline and other flammable substances should never be stored or used in the same vicinity or area containing a gas water heater or other open flame or spark producing appliance.

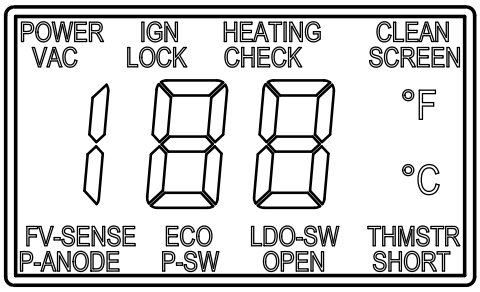
Figure 23.



Should the FV-Sensor of this water heater detect the presence of flammable vapors the following FV-Sense Reset Sequence must be entered into the Electronic Control Display. **NOTE: “BEFORE RESETTING THE FVIR SENSE IN THE ELECTRONIC CONTROL DISPLAY, THOROUGHLY INSPECT THE AREA AND REMOVE THE SOURCE OF THE FLAMMABLE VAPORS”**.

1. Manual reset is accomplished by first turning off the power to the water heater for at least 10 seconds.
2. Then, while pressing the two temperature adjustment buttons on the display, turn the switch on the gas control valve/thermostat to the on position. All the display icons will start to flash. Temporarily release both temperature adjust buttons and within 2 seconds, press both temperatures adjust buttons again until all the display icons are on steady. Release the two temperature adjust buttons. The system will clear the fault, perform a reset, and normal operation will be restored.

ELECTRONIC CONTROL DISPLAY TROUBLESHOOTING



ELECTRONIC CONTROL DISPLAY

Please check guidelines below. For your safety, water heater service should be performed only by a qualified service person.
Read the GENERAL SAFETY INFORMATION supplied by the water heater manufacturer.

	CONTROL DISPLAY STATUS	PROBLEM	SOLUTION
1.	"POWER" Flashing	Communication Error The system has detected a communication error between the upper and lower controls.	1. Check the 5-conductor data cable that runs between the upper and lower controls. Check that the wiring is not broken, and the connectors on both ends are properly seated in the mating connectors. 2. Replace the upper control, if the error code does not clear - cycle power to the water heater "Off" and "On" to reset. 3. Replace the lower control if the problem persists.
2.	"HEATING" and "SHORT" Flashing	The self-diagnostic tests have found a problem with an internal circuit.	1. Turn the power off for 10 to 20 seconds then on again to clear the error code. 2. If the error code persists or cannot be cleared, replace the lower control.
3.	"HEATING" and "OPEN" Flashing	Ignition/flame failure. The water heater has reached the maximum number of retries and is currently locked out for one hour. Cycle the power to the water heater off and on to reset.	1. Gas supply is turned off – pressure too low. Ensure supply and manifold gas pressures are within requirements in the installation manual. Manifold gas pressure is non-adjustable, if pressure is off by more than 0.3" W.C. (75 Pa) replace the lower control. 2. Low supply voltage – should be 115 – 125 VAC. 3. Ensure flame sensor is making good contact with the burner flame, ensure flame is steady. 4. Ensure the flame sensor is clean – use ultra fine steel wool or Scotch-Brite™ pad to clean the flame sensor. 5. Ensure the hot surface ignitor is positioned to provide consistent ignition. 6. Check for any cracks in the ignitor assembly ceramic insulators – replace ignitor assembly if damaged. 7. Check resistance of the ignitor at room temperature (77°F – 25°C) at the plug end. Replace ignitor if the resistance is not within 1.72 to 2.4 ohms at room temperature.
4.	"HEATING", "OPEN", and "SHORT" Flashing	Weak flame sensor current.	1. Ensure flame sensor is making good contact with the burner flame, ensure flame is steady. 2. Ensure the flame sensor is clean – use ultra fine steel wool or Scotch-Brite™ pad to clean the flame sensor.
5.	"ECO" and "OPEN" Flashing	Water temperature in the tank has exceeded 185°F (85°C) and has activated the ECO.	1. Turn the power off for 10 – 20 seconds then on again to clear this error code. 2. Replace the lower control if the error code persists.

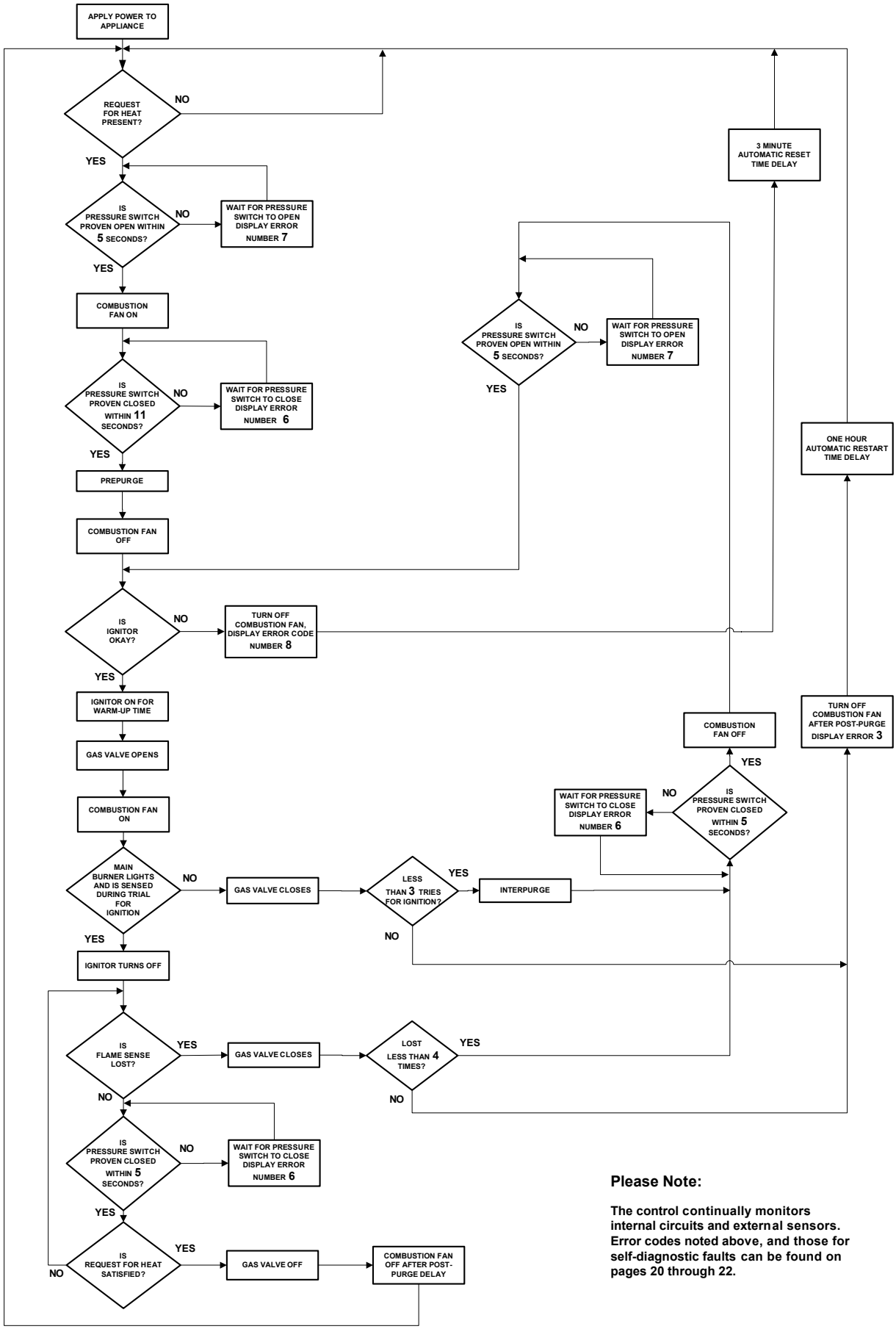
CONTROL DISPLAY TROUBLESHOOTING

	CONTROL DISPLAY STATUS	PROBLEM	SOLUTION
6.	"P-SW", "OPEN", and "CLEAN SCREEN" Flashing	The air pressure switch contacts remain open longer than 11 seconds after the combustion fan is energized.	1. Clean the screen on the combustion air intake chamber. Turn the power "OFF" for 10 to 20 seconds then "ON" again to clear the error code. If the problem persists: 2. Ensure the pressure switch sensing tube is in good condition and securely connected at both ends. 3. Ensure the inner door to the combustion chamber is secure and the gasket is properly sealing. 4. Check operation of the air intake chamber fan and pressure switch. A. Turn off power to the water heater. B. Remove the tubing from the pressure switch and the wires from both terminals of the pressure switch. C. Connect a digital manometer to the open end of the tubing from the air intake chamber. Turn on the power to the water heater and when the fan turns on, measure the pressure reading in the tubing. If the pressure reading reaches the .22" WC *make point* of the pressure switch, turn off power to the water heater and reconnect tubing to the pressure switch. If pressure reading does not reach the .22" WC *make point*, check the system and tubing for restrictions and cleanliness. D. Attach leads of ohmmeter or continuity tester to the terminals of the pressure switch. Turn on power to the water heater and when the air intake fan comes on, check for continuity across the pressure switch contacts. If switch contacts remain open (no continuity) while the fan is in operation - replace the pressure switch.
7.	"P-SW" and "SHORT" Flashing	The air pressure switch contacts remain closed for more than 5 seconds when they should be open.	1. Turn off power to the water heater. 2. Locate the pressure switch wiring – ensure pressure switch wiring is correct and not jumped. 3. Remove wires to both terminals on pressure switch. 4. Check pressure switch contacts with an ohmmeter for continuity. A. If pressure switch contacts show continuity (closed circuit) replace the pressure switch. B. If pressure switch contacts show open circuit and all wiring is correct – replace the lower control.
8.	"IGN" Flashing	Open ignitor circuit	1. Check all wiring to the hot surface ignitor. 2. Check the 3 pin Molex ignitor assembly plug and receptacle on the lower control for a good connection. Repair or replace parts if necessary. 3. Check resistance of the ignitor with an ohmmeter on the ignitor assembly plug. Replace ignitor if resistance is not within 1.72 and 2.40 ohms. 4. If above checks are good – turn off power for 10 seconds and then back on. If this error code will not clear and the ignitor resistance is within specifications – replace the lower control.
9.	"FV-SENSE" Flashing	Flammable Vapor Sensor has detected the presence of flammable vapors and is in lockout	1. Do not touch any electrical switch, do not use any phone in the building and do not try to light any appliance. 2. Smell around the water heater to ensure there are no gas leaks at the gas control valve or in the supply gas line or for any other type of flammable vapors in the area. 3. Carefully inspect the area surrounding the water heater for any substances such as gasoline, paint, paint thinners, varnish, or cleaners that could emit flammable vapors. Remove anything that can potentially emit flammable vapors from the area and store it properly in a different location. ~ continued next page ~

CONTROL DISPLAY TROUBLESHOOTING

	CONTROL DISPLAY STATUS	PROBLEM	SOLUTION
9.	"FV-SENSE" Flashing (Continued from previous page)		4. System must be manually reset by entering a special FVS reset sequence into the Electronic Control Display. See **Electronic Control Display - FV - Sense Reset Sequence** for instructions. It is also recommended that the FV Sensor be replaced.
10.	"LDO-SW", "OPEN", and "CLEAN SCREEN" Flashing	The air pressure switch contacts remain open longer than 5 seconds after the combustion fan is energized.	1. Clean the screen on the combustion air intake chamber, retest. 2. If the problem persists: Cycle power to the water heater "OFF" and "ON" to reset.
11.	"FV-SENSE" and "OPEN" Flashing	Flammable Vapor Sensor is open	1. Check all wiring to the flammable vapor sensor. 2. Remove the connectors from the flammable vapor sensor and measure the resistance of the sensor with an ohmmeter. A. If the reading taken is more than 1.7 million ohms, replace the flammable vapor sensor. B. If the reading taken is less than 1.7 million ohms, and the wiring from the control to the sensor is good, replace the lower control.
12.	"FV-SENSE" and "SHORT" Flashing	Flammable Vapor Sensor is shorted	1. Check all wiring to the flammable vapor sensor. 2. Remove the connectors from the flammable vapor sensor and measure the resistance of the sensor with an ohmmeter. A. If the reading taken is less than 2000 ohms, replace the flammable vapor sensor. B. If the reading taken is more than 2000 ohms, and the wiring from the control to the sensor is good, replace the lower control.
13.	"THMSTR" and "OPEN" Flashing	The self-diagnostic test has detected the temperature sensor (thermistor) inside the immersion probe is open.	1. Turn power off for 10 to 20 seconds then on again to clear this error code. 2. This part of the control cannot be replaced or serviced. If the error code cannot be cleared, the lower control must be replaced.
14.	"THMSTR" and "SHORT" Flashing	The self-diagnostic test has detected the temperature sensor (thermistor) inside the immersion probe is shorted.	1. Turn power off for 10 to 20 seconds then on again to clear this error code. 2. This part of the control cannot be replaced or serviced. If the error code cannot be cleared, the lower control must be replaced.
15.	All Segments Flashing	The self-diagnostic check has detected one or both of the temperature adjustment buttons are stuck.	1. Press and release each of the temperature adjustment buttons. If the above action does not clear the error, the control will continue to regulate the water temperature at the last setting. However, settings will no longer be adjustable – the upper control should be replaced.
16.	"P-ANODE" and "OPEN" Flashing	No current to Power Anode.	1. Check the wire that runs from the power anode to the upper control. Check the wire for damage, and to ensure that the connectors are fully seated into the mating connectors on both ends. 2. Check that the tank is full of water. Never use this water heater unless it is completely full of water. To prevent damage to the tank, the tank must be filled with water. Water must flow from the hot water faucet before turning "ON" gas to the water heater. 3. Cycle power to the water heater "OFF" and "ON" to reset.
17.	"P-ANODE" Flashing	Power Anode circuit failure.	1. Turn the power off for 10 to 20 seconds then on again to clear the error code. 2. If the error code persists or cannot be cleared, replace the upper control.

TROUBLESHOOTING FLOWCHART



Please Note:

The control continually monitors internal circuits and external sensors. Error codes noted above, and those for self-diagnostic faults can be found on pages 20 through 22.

EXTERNAL INSPECTION AND CLEANING

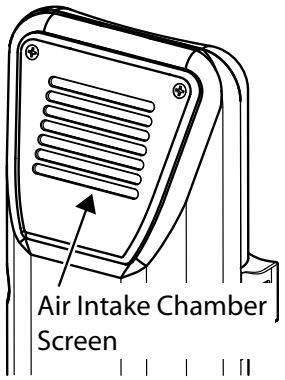
Cleaning the Air Intake Chamber Screen:

- At least twice annually the air intake chamber screen should be inspected for any dust or debris that may have accumulated on the louvers.

NOTE: If the water heater is located in an area that is subjected to lint, pet hair or dirt, it may be necessary to check the air intake chamber screen more frequently.

- Use a vacuum cleaner with a hose attachment to remove any dust or debris that may have accumulated on the screen.

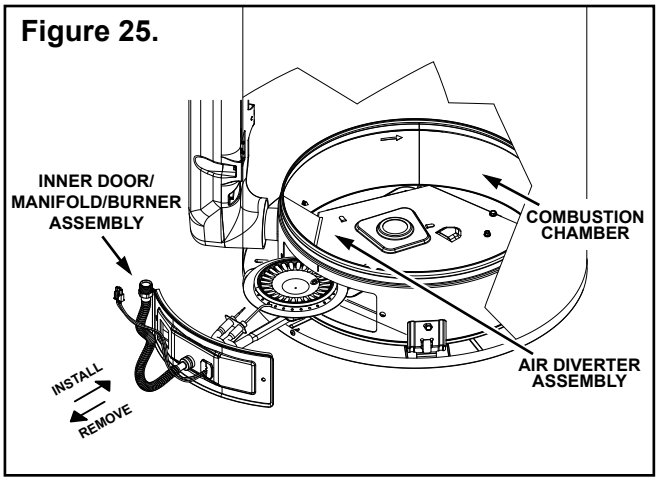
Figure 24.



Cleaning the Combustion Chamber and Air Diverter Assembly:

- Follow procedure outlined in “Removing Inner Door/Manifold/Burner Assembly”, page 41.
- Use a vacuum cleaner/shop vac to remove all loose debris in the combustion chamber. Use compressed air to clear any dust or debris that may have accumulated on the air diverter assembly.
- Reassemble following the procedure under “Installing Inner Door/Manifold/Burner Assembly”, page 42.

Figure 25.



ELECTRONIC CONTROL DISPLAY REMOVAL / REPLACEMENT

Important: Use only factory authorized replacement parts. If you lack the necessary skills to properly perform the installation, you should not proceed, but get help from a qualified service technician.

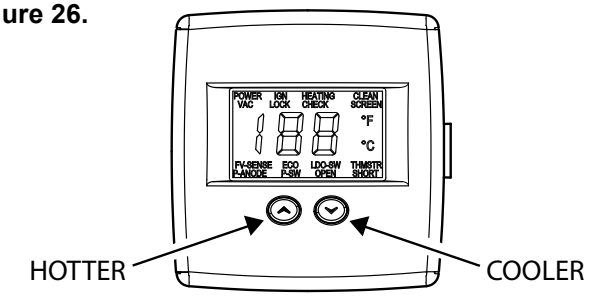
Removing the Electronic Control Display:

1. Set the gas control valve/thermostat to its lowest setting by pressing the “COOLER” and “HOTTER” buttons together at the same time holding for 1 second. Then press the “COOLER” button to the lowest setting (Figure 26).
2. Turn gas control switch to the “OFF” position (located right side of the gas control valve/ thermostat) and turn off the gas supply to the unit (Figure 27).
3. Disconnect the electric connection by unplugging the transformer from the wall outlet (Figure 27).
4. Remove the electronic control display by squeezing in both sides of the display and removing from the slots in the water heater’s front (Figure 28).
5. Unplug the electronic control display electrical connector from the back of the electronic control display by depressing the locking snap and pulling out of the electronic control display electrical connection, also remove the power anode wire connector by pulling it off of the power anode control display terminal (Figure 29).

Installing the Electronic Control Display:

6. Plug the power anode electrical wire terminal onto the power anode connector terminal (Figure 29).
7. Insert the electronic control display electrical connector into the electronic control display electrical connection by aligning the connector pins (note orientation of the connector pins) and pressing down ensuring the electrical connector snap is locked into place (Figure 29).
8. Install the electronic control display onto the front of the water heater by squeezing both sides of the electronic control display inserting the prongs into the water heater’s slots (please note the orientation of the electronic control display and the routing the wiring inside so as not be pinched between the display and the water heater’s front) (Figure 28).
9. Turn on the electrical and the gas supplies to the water heater. Plug in the electric connection from the transformer to the electric outlet (Figure 27).
10. Restart the water heater by following the directions on the “Lighting and Operating Instructions” label located on the front of the water heater.

Figure 26.



Electronic Control Display

Figure 27.

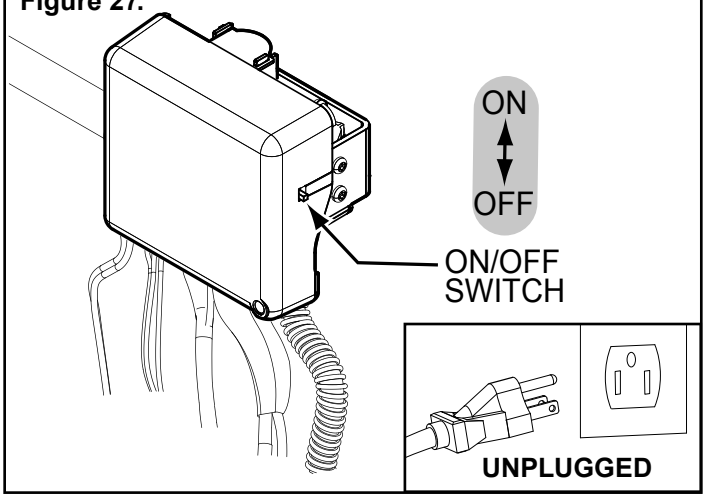


Figure 28.

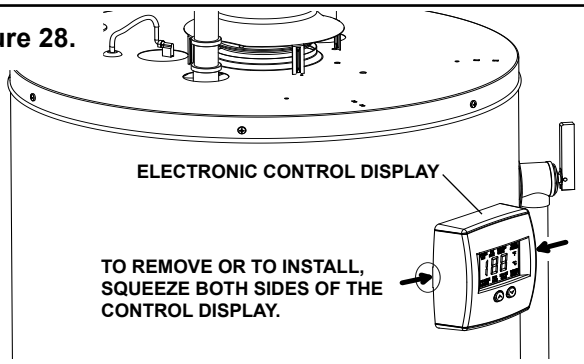
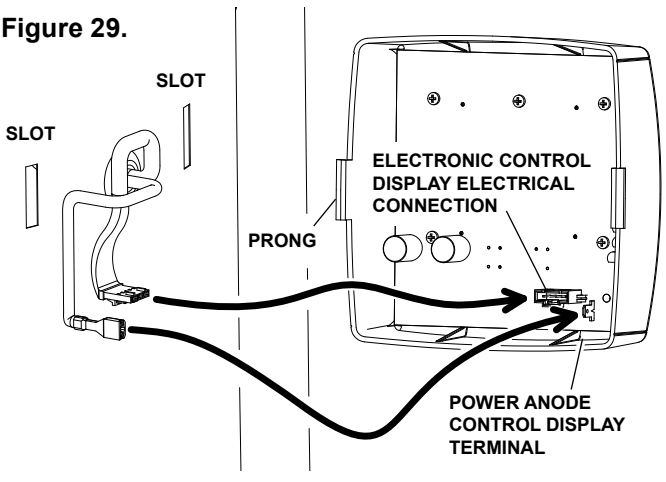


Figure 29.



POWERED ANODE ROD REMOVAL / REPLACEMENT

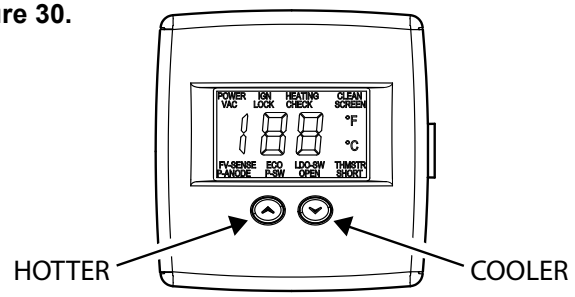
Important: Use only factory authorized replacement parts. If you lack the necessary skills to properly perform the installation, you should not proceed, but get help from a qualified service technician.

Tools required: Ratchet with 1-1/16" Socket, Pliers, and Teflon® Tape or an approved pipe sealant.

Removing the Powered Anode Rod:

1. Set the gas control valve/thermostat to its lowest setting by pressing the "COOLER" and "HOTTER" buttons together at the same time holding for 1 second. Then press the "COOLER" button to the lowest setting (Figure 30).
2. Turn gas control switch to the "OFF" position (located right side of the gas control valve/ thermostat) and turn off the gas supply to the unit (Figure 31).
3. Disconnect the electric connection by unplugging the transformer from the wall outlet (Figure 31).
4. Shut off the incoming water supply to the water heater and open a nearby hot water faucet to depressurize the water tank.
5. Remove the manifold cover outer door and connect a hose to the drain valve and terminate it to adequate drain or to the exterior of the building. Open the drain valve and allow at least 5 gallons of water from the tank to drain. Close drain and remove hose.
6. Unplug the electrical connection on top of the powered anode by pulling the wire connector up and off of the powered anode rod electrical connector (Figure 32).
7. Remove the powered anode rod by using a ratchet and a 1-1/16" socket turning counterclockwise (Figure 33). Note: Figure 33 is shown exploded, if the socket used is short well you may have to remove the top male connector first before removing the powered anode rod.

Figure 30.



Electronic Control Display

Figure 31.

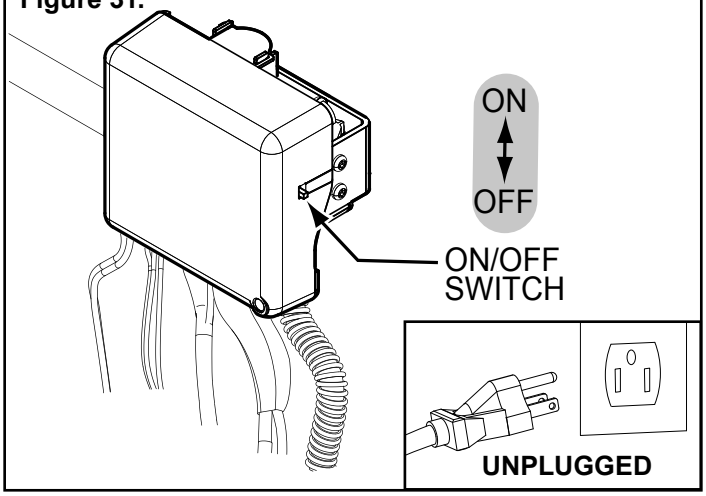


Figure 32.

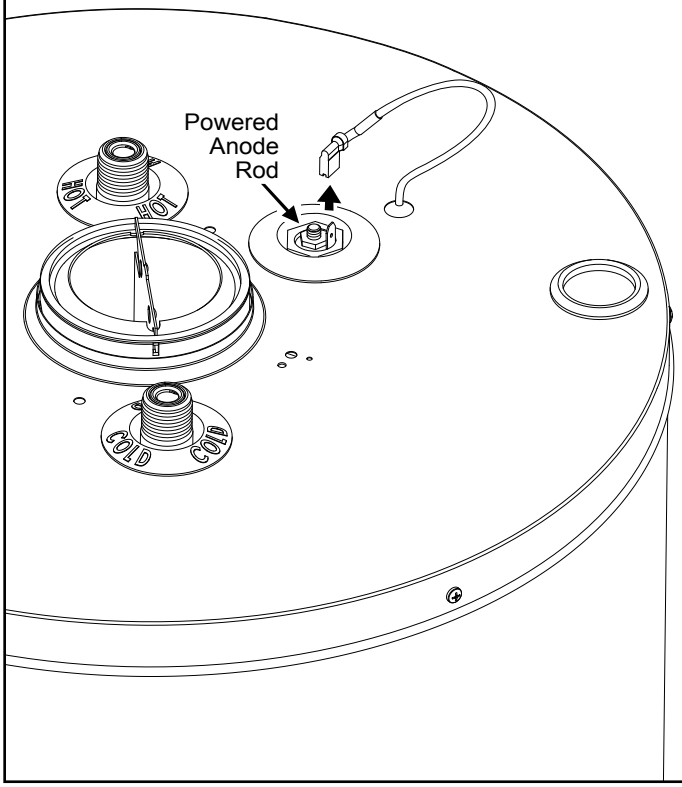
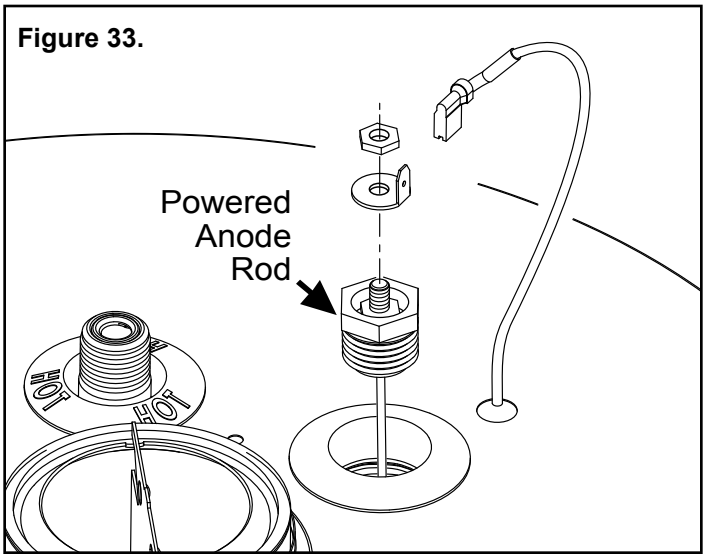


Figure 33.



Installing the Powered Anode Rod:

8. Use Teflon® tape or an approved pipe sealant on threads of the new powered anode rod.
9. Prior to installing, it will be necessary to use pliers to bend up approximately 90° the electrical male connector on the top of the powered anode rod. The electrical connector should be bent upward in order to allow the 1-1/16” deep well socket to pass over the connector. Note: if using a short well socket the male connector must first be removed (Figure 34 is shown exploded for clarity).
10. Place the powered anode rod in the spud (top of the tank) and turn clockwise until the threads are hand tight. Using a ratchet and 1-1/16” socket tighten down water tight (Torque should be between 65 to 120 foot pounds).
11. Open a nearby hot water faucet to purge air from the water line. Fill water heater tank completely (Note: to assure the water heater tank is full, keep the hot water faucet open for 3 minutes after a constant flow of water is obtained).
12. After turning off the hot water faucet, check for water leaks around powered anode rod and immediately correct any if found.
13. Upon determining there’s no water leak at the newly installed powered anode rod, reconnect the electrical plug connector to the top of the anode male terminal.
14. Plug the electric transformer in the wall outlet and turn the gas supply back on to the gas control valve/thermostat.
15. Turn the gas control switch to the “ON” position (located on the side of the gas control valve/ thermostat see Figure 35).
16. To restart the water heater, follow the directions on the “Lighting and Operating Instructions” label located on the front of the water heater near the gas control valve/thermostat.
17. Upon verifying proper operation of the water heater, replace the manifold cover outer door.

Figure 34.

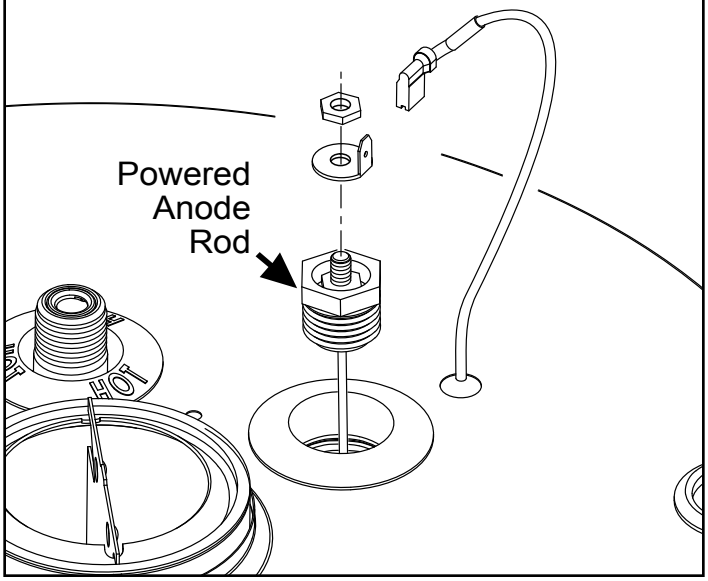
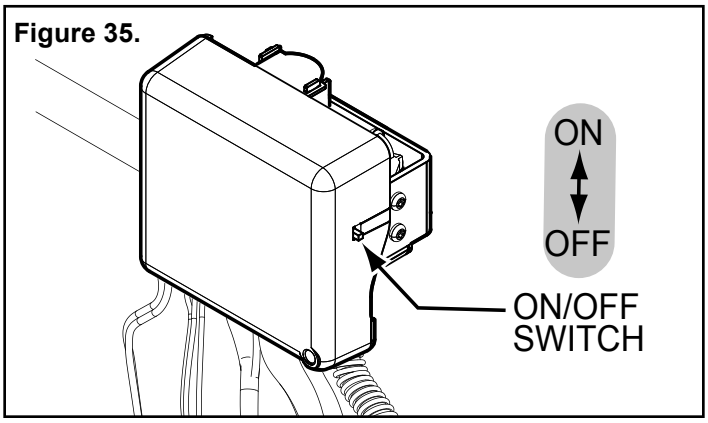


Figure 35.



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PRESSURE SWITCH REMOVAL / REPLACEMENT

Important: Use only factory authorized replacement parts. If you lack the necessary skills to properly perform the installation, you should not proceed, but get help from a qualified service technician.

Tools required: Phillips Head Screwdriver.

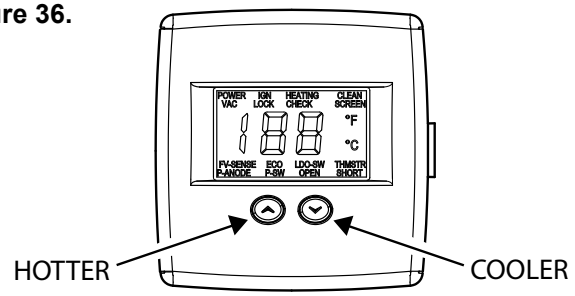
Removing the Pressure Switch:

1. Set the gas control valve/thermostat to its lowest setting by pressing the “COOLER” and “HOTTER” buttons together at the same time holding for 1 second. Then press the “COOLER” button to the lowest setting (Figure 36).
2. Turn gas control switch to the “OFF” position (located right side of the gas control valve/ thermostat) and turn off the gas supply to the unit (Figure 37).
3. Disconnect the electric connection by unplugging the transformer from the wall outlet (Figure 37).
4. Remove the manifold cover/ outer door from the unit by depressing on the lower portion and pulling outward.
5. Remove the air pressure tubing from the air pressure switch by pulling downward on the tubing at the connection to the air pressure switch (Figure 38).
6. Remove the two (2) electrical flag terminals from the switch by pulling outward and off of the switch (Figure 39).
7. Using a phillips head screwdriver, remove the 2 screws securing the pressure switch to the water heater’s side (keep these screws in a safe place for reinstallation later) (Figure 39).

Installing the Pressure Switch:

8. Secure the new pressure switch to the water heater’s side by reusing the 2 screws removed in step 7 (Figure 39).
9. Reattach the two (2) electrical flag terminals by pushing the flag terminals onto the switch (Figure 39).
10. Reattach the air pressure tubing to the air pressure switch by pushing the tubing onto the connector until the end of the tubing pushes to the shoulder of the connector (Figure 38).
11. Turn on the electrical and the gas supplies to the water heater. Plug in the electric connection from the transformer to the electric outlet (Figure 37).
12. Restart the water heater by following the directions on the “Lighting and Operating Instructions” label located on the front of the water heater.
13. Upon verifying proper operation of the water heater, replace the manifold cover/outer door.

Figure 36.



Electronic Control Display

Figure 37.

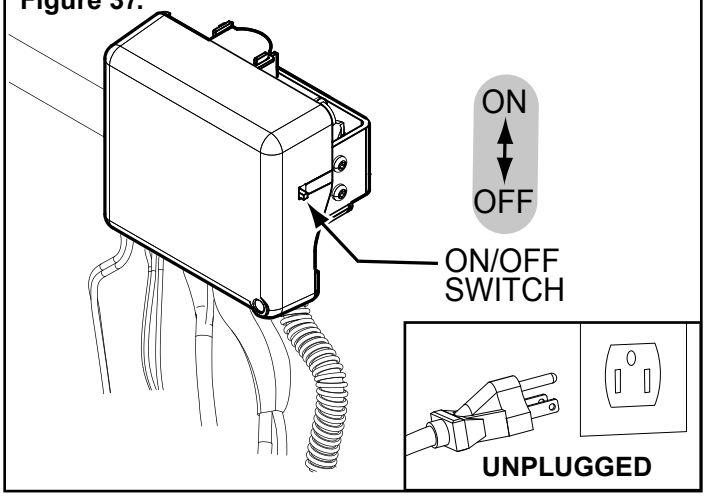


Figure 38.

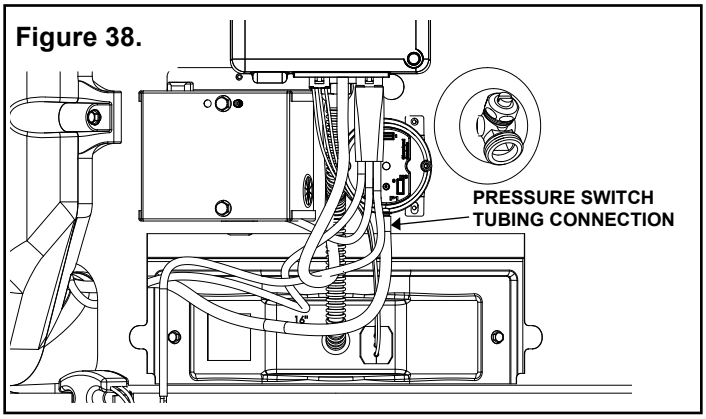
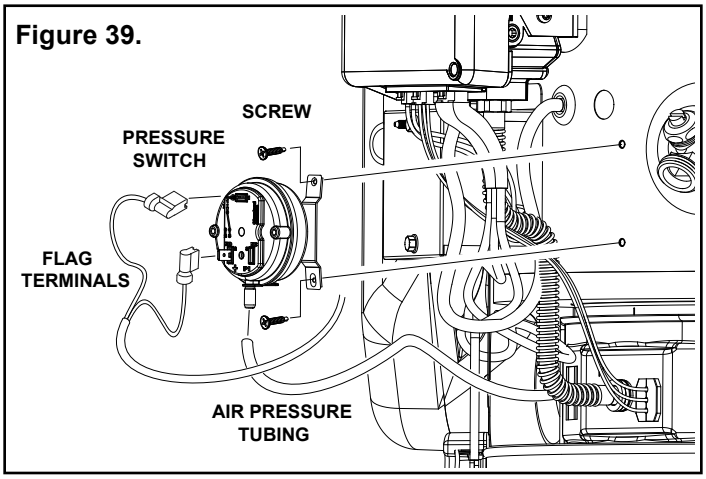


Figure 39.



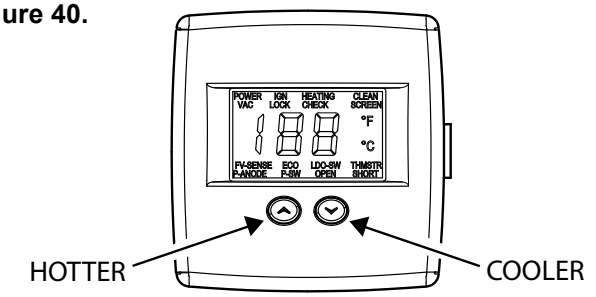
TRANSFORMER REMOVAL / REPLACEMENT

Important: Use only factory authorized replacement parts. If you lack the necessary skills to properly perform the installation, you should not proceed, but get help from a qualified service technician.
Tools required: Ratchet with 5/16" Socket or 5/16" Nut Driver, Phillips Head Screwdriver.

Removing the Transformer:

1. Set the gas control valve/thermostat to its lowest setting by pressing the "COOLER" and "HOTTER" buttons together at the same time holding for 1 second. Then press the "COOLER" button to the lowest setting (Figure 40).
2. Turn gas control switch to the "OFF" position (located right side of the gas control valve/ thermostat) and turn off the gas supply to the unit (Figure 41).
3. Disconnect the electric connection by unplugging the transformer from the wall outlet (Figure 41).
4. Remove the manifold cover outer door from the heater by depressing on the lower portion and pulling outward.
5. Unplug the power supply transformer connector from the bottom of the gas control valve by pressing the snap connector and pulling downward (Figure 42). (NOTE: The transformer is located inside the transformer box adjacent to the gas control/thermostat valve).
6. Using a phillips head screwdriver, remove the transformer box from the side of the water heater by removing the single screw securing it to the water heater's side (Note: keep screw in a safe place for reinstalling later).
7. Using a phillips head screwdriver remove the ground screw from the inside of the transformer box (Note: save the screw for reinstallation later) (see Figure 43).
8. Take note of the position of the transformer, use a 5/16" nut driver or a ratchet with a 5/16" socket to remove the 2 hex head screws on the front of the transformer box (Note: save the screws for reinstallation later) (see Figure 43).
9. Unplug the two flag terminal electrical connections on the transformer and pull the wiring and connector through the wire protector (Figure 43).

Figure 40.



Electronic Control Display

Figure 41.

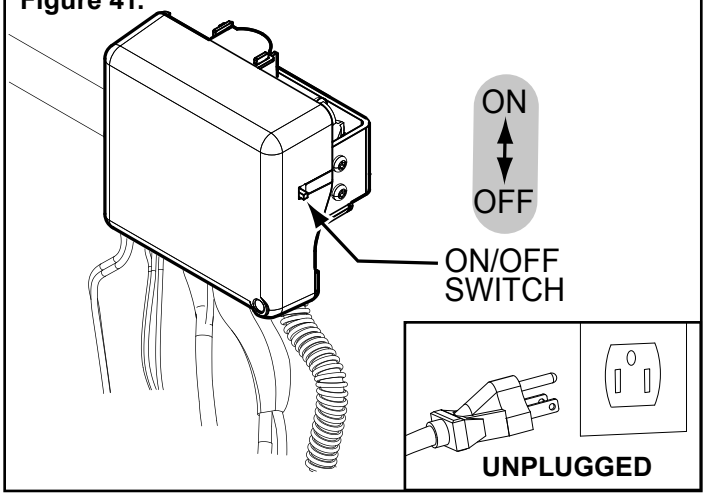


Figure 42.

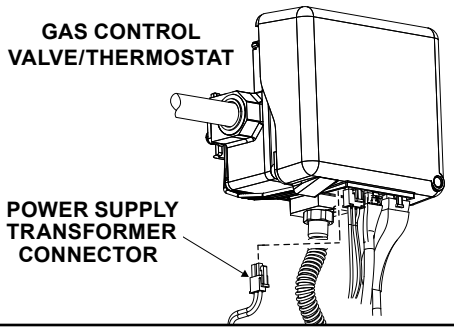
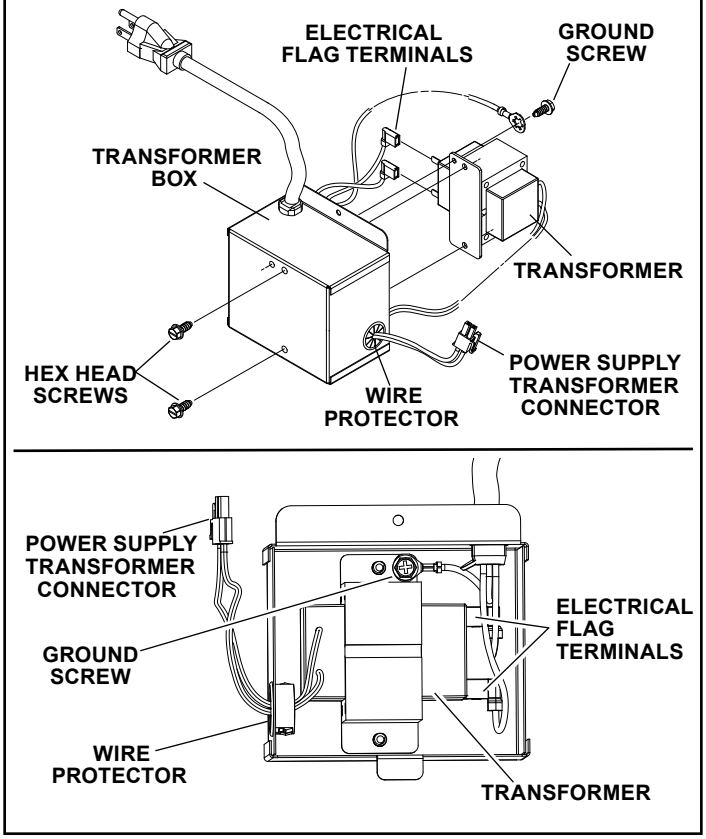


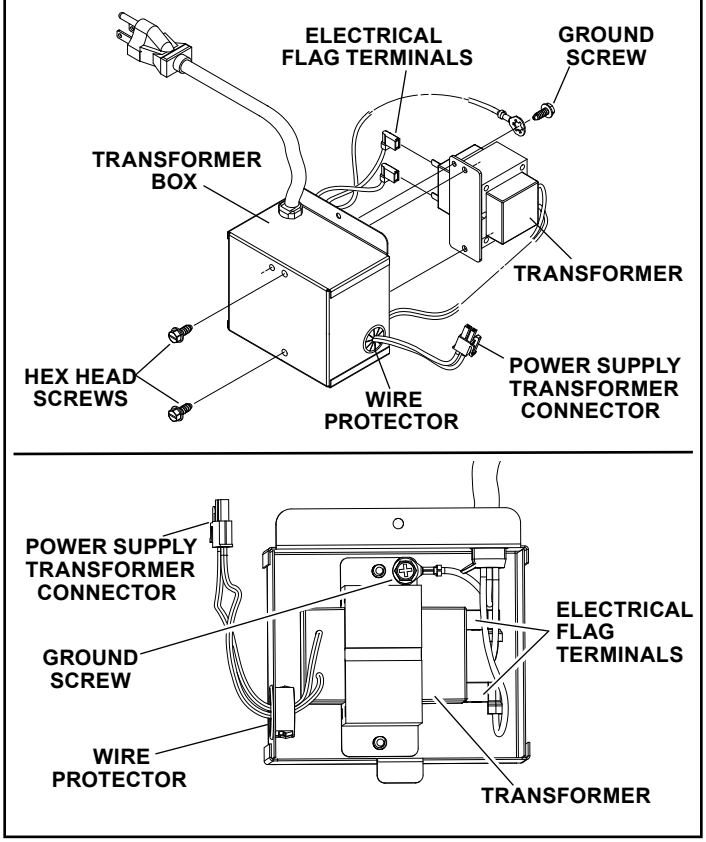
Figure 43.



Installing the New Transformer:

10. Insert the wiring connector that goes to the gas control valve/thermostat through the wire protector on the side of the transformer box (Figure 44).
11. Attach the two (2) flag terminal connectors to the transformer by aligning and pressing down (Figure 44).
12. Position the new transformer inside the transformer box where the wiring connections are nearest their exit points (Figure 44).
13. Align the holes of the transformer mounting bracket to the hole of the transformer box and attach using the 2 hex head screws (Note: take care not to pinch any wiring between the transformer and the transformer box) (see Figure 44).
14. Insert the ground wire connector through the ground screw and tighten in place with a phillips head screwdriver (Figure 44).
15. Using the screw removed in step 6, reattach the transformer box to the water heater's side.
16. Reattach the power supply transformer connector to the bottom of the gas control valve/thermostat by aligning and pushing upward (Figure 42).
17. Plug the electric transformer in the wall outlet and turn the gas supply back on to the gas control valve/thermostat (Figure 41).
18. Turn the gas control switch to the "ON" position (Figure 41).
19. To restart the water heater, follow the directions on the "Lighting and Operating Instructions" label located on the front of the water heater near the gas control valve/thermostat.
20. Upon verifying proper operation of the water heater, replace the manifold cover outer door.

Figure 44.



AIR INTAKE CHAMBER BOX REMOVAL / REPLACEMENT

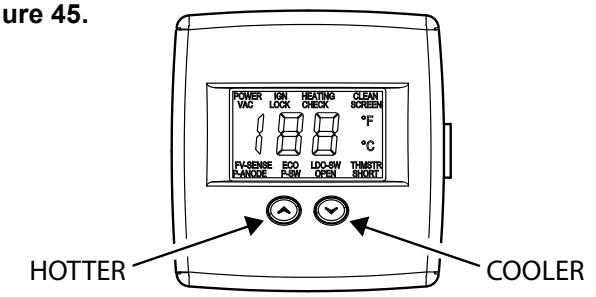
Important: Use only factory authorized replacement parts. If you lack the necessary skills to properly perform the installation, you should not proceed, but get help from a qualified service technician.

Tools required: Phillips Head Screwdriver.

Removing the Air Intake Chamber Box:

1. Set the gas control valve/thermostat to its lowest setting by pressing the “COOLER” and “HOTTER” buttons together at the same time holding for 1 second. Then press the “COOLER” button to the lowest setting (Figure 45).
2. Turn gas control switch to the “OFF” position (located right side of the gas control valve/ thermostat) and turn off the gas supply to the unit (Figure 46).
3. Disconnect the electric connection by unplugging the transformer from the wall outlet (Figure 46).
4. Remove the manifold cover/ outer door from the unit by depressing on the lower portion and pulling outward.
5. Unplug the 3-wire pressure switch/fan/sensor electrical connection of the wiring harness from the gas control valve/thermostat by depressing the lower portion of the snap clip to open and pulling down the connector (Figure 47).
6. Using a phillips head screwdriver remove the 2 screws of the air intake chamber screen (Note: save screws for reinstallation later) (Figure 48).
7. Remove the air intake chamber screen by lifting upward and outward (Figure 48).
8. Please take note of the wire position routing around the fan inside the air intake chamber as this wire positioning will need to be duplicated upon installation of the fan in the new intake chamber box.
9. Remove the 2 screws securing the fan inside the chamber (Note: save these screws for reinstallation later) (Figure 48).
10. Lift the fan up and outward to remove from the air intake chamber (Figure 48).
11. Locate the male to female electrical connection with close pin lock on wiring harness (the white connection approximately 12” from fan) (Figure 48).
12. To separate the electrical connection of the fan and wiring harness: press down on the back portion of the close pin lock of the electrical connection while pulling the connection in the opposite directions.
13. Using a phillips head screwdriver, remove the 4 screws securing the air intake chamber box to the water heater’s side (also keeping these screws in a safe place for reinstallation later) (Figure 48).

Figure 45.



Electronic Control Display

Figure 46.

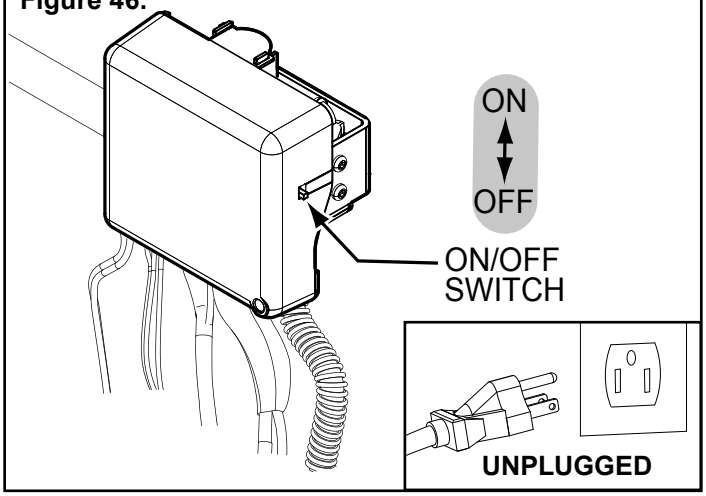


Figure 47.

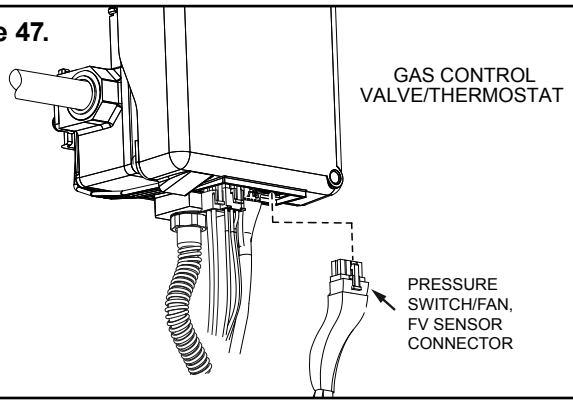
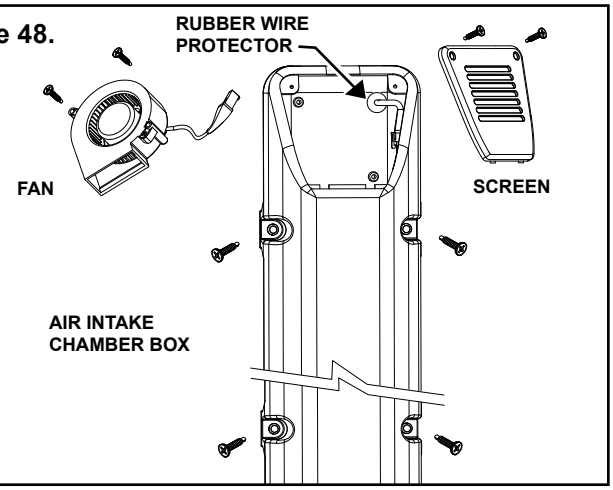


Figure 48.



14. Rotate the top of the air intake chamber box from left to right (only a few inches in both directions) while pulling outward at the bottom removing the air intake chamber box from the combustion chamber pipe saving the air intake chamber gasket for reinstallation (Figure 49).
15. Unplug the air pressure tubing from the back of the old air intake chamber box (Figure 50).
16. The wire harness goes through the rubber wire protector in the back of the air intake chamber box (Figure 50).
17. Reach inside the air intake chamber box and push on the center of the rubber wire protector pushing it and the wiring harness wires to the outside of the air intake chamber box.
18. Remove the wiring harness from the wire channeling in the back center of the air intake chamber box. The old air intake chamber box is now separated and can be discarded (Figure 50).

Installing the Air Intake Chamber Box:

19. Insert the fan wiring harness wire through the back and into the fan box compartment by threading the connector through the opening and insert in approximately 6 inches of wiring (up to the rubber wire protector) (Figure 50).
20. Push the rubber wire protector into place in the back of the air intake chamber box (Note: the rubber wire protector **must** be positioned properly and locked into place around both sides of the air intake chamber box) (Figure 50).
21. Position the wiring harness wire in the wiring channeling molded down the back center of the air intake chamber box (Figure 50).
22. Connect the air pressure tubing to the fitting on the air intake chamber box and route tubing in molded inlaid of the air intake chamber box (Figure 50).
23. Reinstall the air intake chamber gasket (removed in step 14) on the back lower portion of the new air intake chamber box (Figure 51).
24. Install the new air intake chamber box to the combustion chamber pipe. Using a small amount of soapy water will help. **Do not** get any water or soapy water on any electrical connections or gas control components (see Figure 52). **(NOTE: UNDUE PRESSURE OR SUDDEN FORCE SUCH AS HAMMERING OR BEATING ON THE AIR CHAMBER BOX WITH ANY OBJECT INCLUDING YOUR HANDS WILL DAMAGE THE AIR INTAKE CHAMBER BOX AND RESULT IN FAILURE TO THE HEATER'S OPERATION.**

Figure 49.
AIR INTAKE CHAMBER BOX REMOVAL

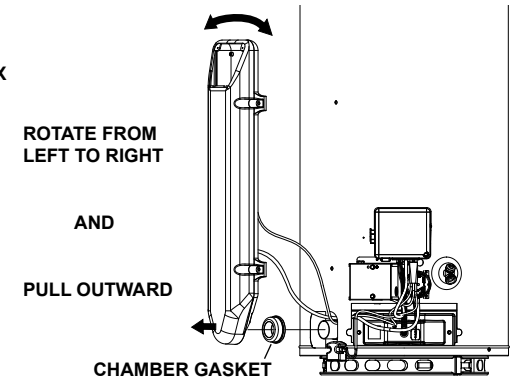


Figure 50.

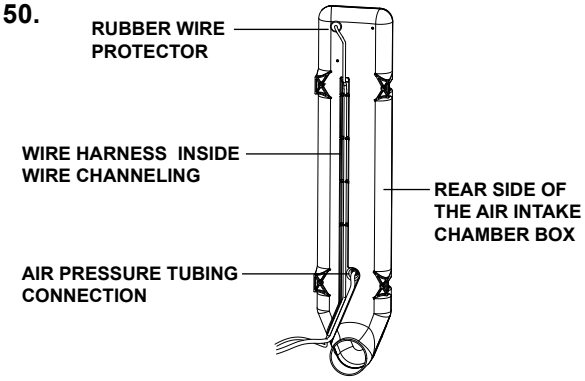

RUBBER WIRE PROTECTOR
WIRE HARNESS INSIDE WIRE CHANNELING
REAR SIDE OF THE AIR INTAKE CHAMBER BOX
AIR PRESSURE TUBING CONNECTION

Figure 51.

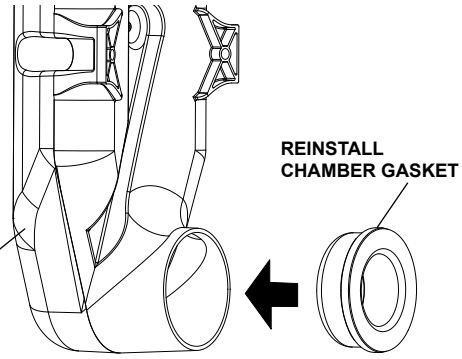
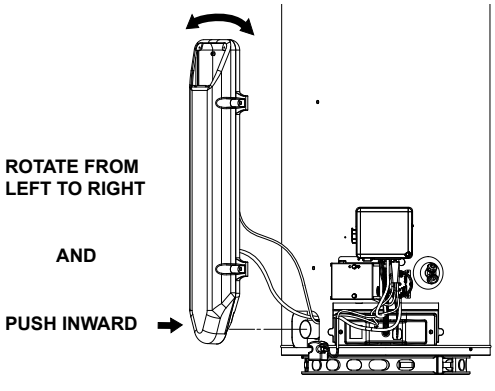
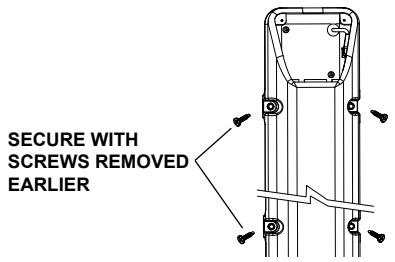


Figure 52.
AIR INTAKE CHAMBER BOX INSTALLATION



25. Install the air intake chamber box by rotating the top of the air intake chamber box from left to right (only a few inches in both directions) while pressing on the bottom portion of the air intake chamber box. When properly installed the air intake chamber box will be in place against the water heater's side aligning with the screw holes.
26. Secure the air intake chamber box to the water heater's side by reusing the 4 screws removed in step 13 (Figure 53).

Figure 53.



Installing the Fan in the Air Intake Chamber Box:

27. Plug the electrical connections of the fan into the wiring harness: Align the electrical connections in such a position as to ensure the locking portions of the connections are on the same side. Gently push the electrical connectors together until the snap lock on the wiring harness engages the angular lock on the fan connector. **Do Not** use undue force in pushing these connectors together (Figure 54). (Note: Connectors are designed in such a manner if the connection is not properly aligned they will not lock together).
28. Replace the fan inside the air intake chamber box. It is imperative that the square portion of the fan air outlet be placed inside the raised square portion of the air intake chamber fan compartment (Figure 55).
29. Ensuring the fan is properly aligned in the air intake chamber, secure the fan in place using the 2 screws removed in step 9 (Figure 55).
30. Route the wiring inside the fan box to the outer edge of the fan in such a manner to ensure it will not be pinched or damaged upon installation of the air intake screen (Figure 55).
31. Install the air intake chamber screen, ensuring that the prongs of the lower portion of the air intake chamber screen are in place in the holding slots. Using the 2 screws removed in step 6, secure the air intake chamber screen (Figure 56).
32. Reattach the 3-wire wiring harness connector to the gas control valve (Figure 47).
33. Check the air hose tubing connection to the pressure switch to ensure the tubing has not loosen up or pulled off.
34. Turn on the electrical and the gas supplies to the water heater. Plug in the electric connection from the transformer to the electric outlet (Figure 46).
35. Restart the water heater by following the directions on the "Lighting and Operating Instructions" label located on the front of the water heater.
36. Upon verifying proper operation of the water heater, replace the manifold cover/outer door.

Figure 54.

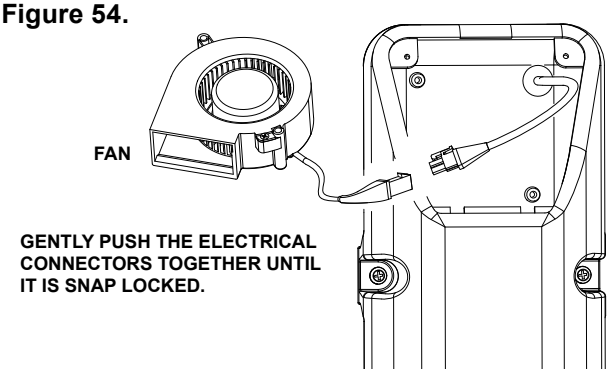


Figure 55.

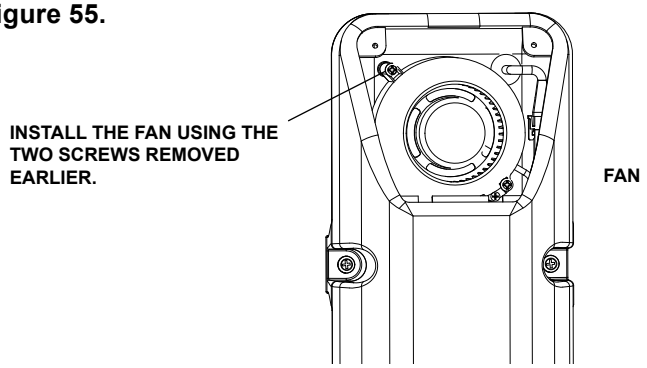
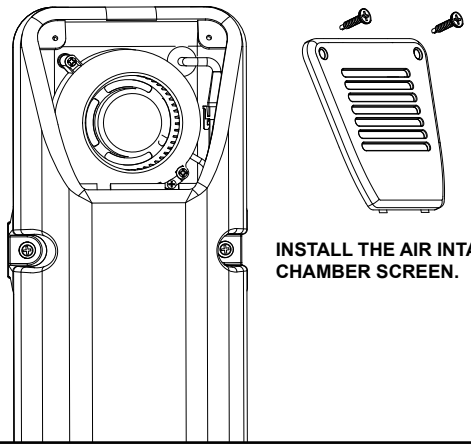


Figure 56.



WIRING HARNESS REMOVAL / REPLACEMENT

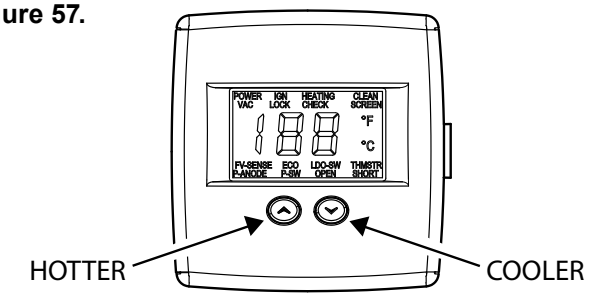
Important: Use only factory authorized replacement parts. If you lack the necessary skills to properly perform the installation, you should not proceed, but get help from a qualified service technician.

Tools required: Phillips Head Screwdriver.

Removing the Air Intake Chamber Box:

1. Set the gas control valve/thermostat to its lowest setting by pressing the “COOLER” and “HOTTER” buttons together at the same time holding for 1 second. Then press the “COOLER” button to the lowest setting (Figure 57).
2. Turn gas control switch to the “OFF” position (located right side of the gas control valve/ thermostat) and turn off the gas supply to the unit (Figure 58).
3. Disconnect the electric connection by unplugging the transformer from the wall outlet (Figure 58).
4. Remove the manifold cover/ outer door from the unit by depressing on the lower portion and pulling outward.
5. Unplug the 3-wire pressure switch/fan/sensor electrical connection of the wiring harness from the gas control valve/thermostat by depressing the lower portion of the snap clip to open and pulling down the connector (Figure 59).
6. Unplug the electric flag terminals and air pressure tubing from the pressure switch (Figure 60).
7. Remove the FV sensor by depressing the snap lock to open the FV sensor cover, slide the FV sensor out of the cover and unplug the electrical flag terminals connections (Note: place the FV sensor in a safe place as it will be reinstalled later) (Figure 60).
8. Using a phillips head screwdriver remove the 2 screws of the air intake chamber screen (Note: save screws for reinstallation later) (Figure 62).
9. Remove the air intake chamber screen by lifting upward and outward (Figure 62).
10. Please take note of the wire position routing around the fan inside the air intake chamber as this wire positioning will need to be duplicated upon installation of the new wiring harness (Figure 62).
11. Using a phillips head screwdriver, remove the 4 screws securing the air intake chamber box to the water heater’s side (also keeping these screws in a safe place for reinstallation later) (Figure 61).
12. Rotate the top of the air intake chamber box from left to right (only a few inches in both directions) while pulling outward at the bottom removing the air intake chamber box from the combustion chamber pipe saving the air intake chamber gasket for reinstallation (Figure 61).

Figure 57.



Electronic Control Display

Figure 58.

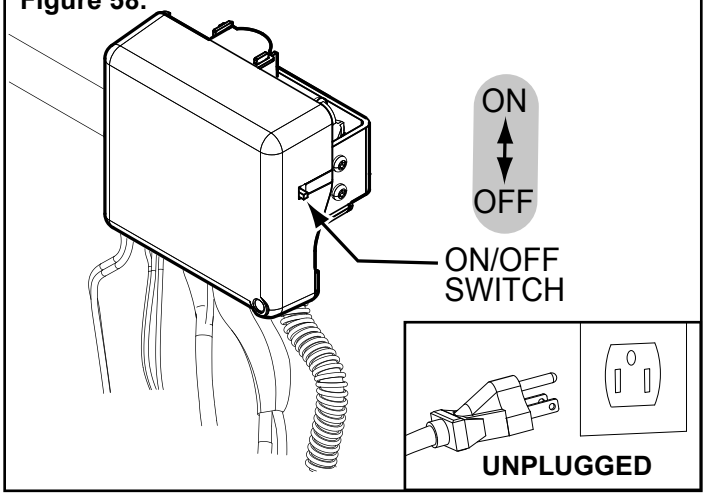


Figure 59.

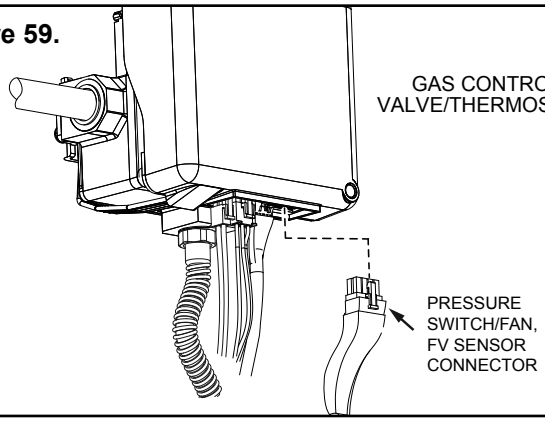
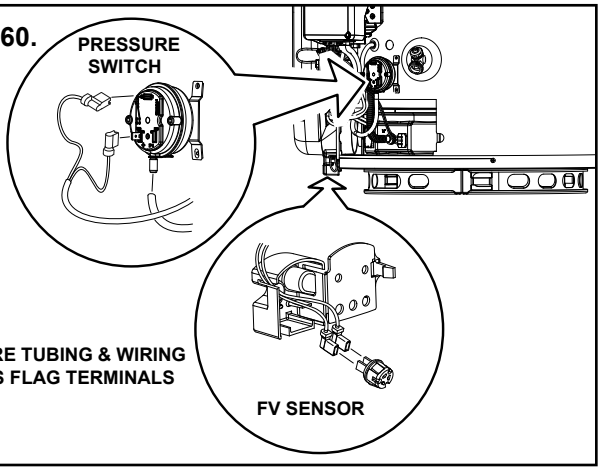


Figure 60.



Replacing the Wiring Harness:

13. Locate the male to female electrical connection with close pin lock on wiring harness (located on the right side of fan) (Figure 62).
14. To separate the electrical connection of the fan and wiring harness: press down on the back portion of the close pin lock of the electrical connection while pulling the connection in the opposite directions.
15. The wire harness goes through the rubber wire protector in the back of the air intake chamber box (Figure 62).
16. Reach inside the air intake chamber box and push on the center of the rubber wire protector pushing it and the wiring harness wires to the outside of the air intake chamber box (Figure 62).
17. Remove the wiring harness from the wire channeling in the back center of the air intake chamber box (Figure 63).
18. The old wiring harness can now be discarded.

Installing the New Wiring Harness:

19. Route the multi-lead portion of the new wiring harness through the opening at the bottom of the water heater's jacket (Figure 64).
20. Insert the fan wiring harness wire through the back and into the fan box compartment by threading the connector through the opening and insert in approximately 6 inches of wiring (up to the rubber wire protector) (Figure 62).
21. Push the rubber wire protector into place in the back of the air intake chamber box (Note: The rubber wire protector **must** be positioned properly and locked into place around both sides of the air intake chamber box) (Figure 63).
22. Position the wiring harness wire in the wiring channeling molded down the back center of the air intake chamber box (Figure 63).
23. Plug the electrical connections of the fan into the wiring harness: Align the electrical connections in such a position as to ensure the locking portions of the connections are on the same side. Gently push the electrical connectors together until the snap lock on the wiring harness engages the angular lock on the fan connector. **Do Not** use undue force in pushing these connectors together (Figure 62). (Note: Connectors are designed in such a manner if the connection is not properly aligned they will not lock together).
24. Route the wiring inside the fan box to the outer edge of the fan in such a manner to ensure it will not be pinched or damaged upon installation of the air intake screen (Figure 62).

Figure 61.
AIR INTAKE CHAMBER BOX REMOVAL

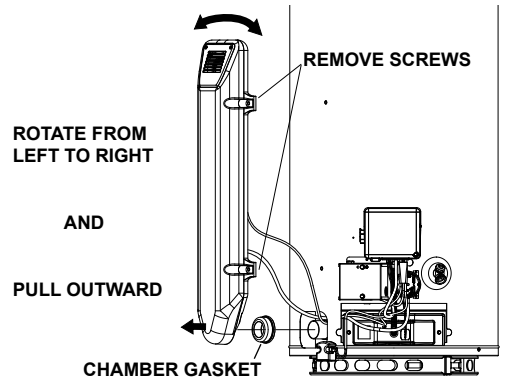


Figure 62.

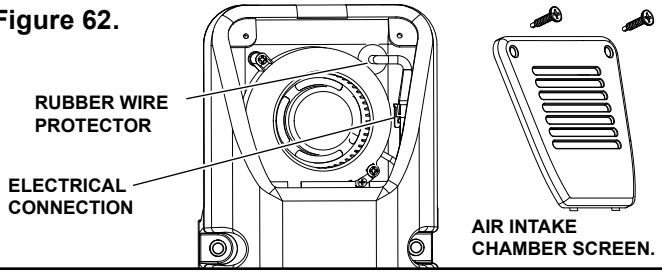


Figure 63.

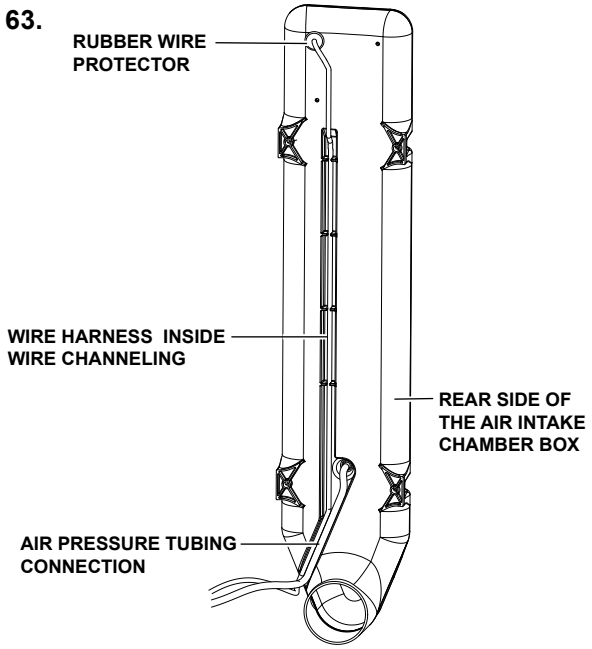
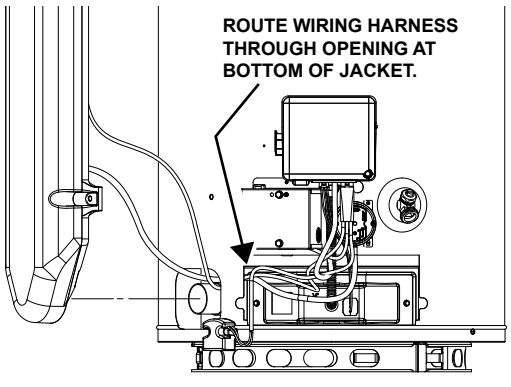

RUBBER WIRE PROTECTOR
WIRE HARNESS INSIDE WIRE CHANNELING
REAR SIDE OF THE AIR INTAKE CHAMBER BOX
AIR PRESSURE TUBING CONNECTION

Figure 64.



25. Install the air intake chamber screen, ensuring that the prongs of the lower portion of the air intake chamber screen are in place in the holding slots. Using the 2 screws removed in step 8, secure the air intake chamber screen (Figure 65).
26. Check the air pressure tubing to the fitting on the of the air intake chamber box and route tubing in molded inlaid of the air intake chamber box (Figure 63).
27. Reinstall the air intake chamber gasket (removed in step 12) on the back lower portion of the new air intake chamber box (Figure 66).
28. Install the new air intake chamber box to the combustion chamber pipe. Using a small amount of soapy water will help. **Do not** get any water or soapy water on any electrical connections or gas control components (Figure 67). **NOTE: UNDUE PRESSURE OR SUDDEN FORCE SUCH AS HAMMERING OR BEATING ON THE AIR CHAMBER BOX WITH ANY OBJECT INCLUDING YOUR HANDS WILL DAMAGE THE AIR INTAKE CHAMBER BOX AND RESULT IN FAILURE TO THE HEATER'S OPERATION.**
29. Install the air intake chamber box by rotating the top of the air intake chamber box from left to right (only a few inches in both directions) while pressing on the bottom portion of the air intake chamber box. When properly installed the air intake chamber box will be in place against the water heater's side aligning with the screw holes (Figure 67).
30. Secure the air intake chamber box to the water heater's side by reusing the 4 screws removed in step 11 (Figure 67).
31. Plug in the electrical flag terminals into the air pressure switch (Figure 60).
32. Reinstall the FV sensor removed in step 7, by depressing the snap lock to open the FV sensor cover, route wiring through sensor cover, plug the electrical flag terminals connections to the FV sensor and slide the FV sensor back inside and close the cover (Figure 60).
33. Connect the air pressure tubing to the pressure switch (Figure 60).
34. Attach the 3-wire wiring harness connector to the gas control valve (Figure 59).
35. Check the air hose tubing connection to the pressure switch to ensure the tubing has not loosened up or pulled off (Figure 60).
36. Turn on the electrical and the gas supplies to the water heater. Plug in the electric connection from the transformer to the electric outlet (Figure 58).
37. Restart the water heater by following the directions on the "Lighting and Operating Instructions" label located on the front of the water heater.
38. Upon verifying proper operation of the water heater, replace the manifold cover/outer door.

Figure 65.

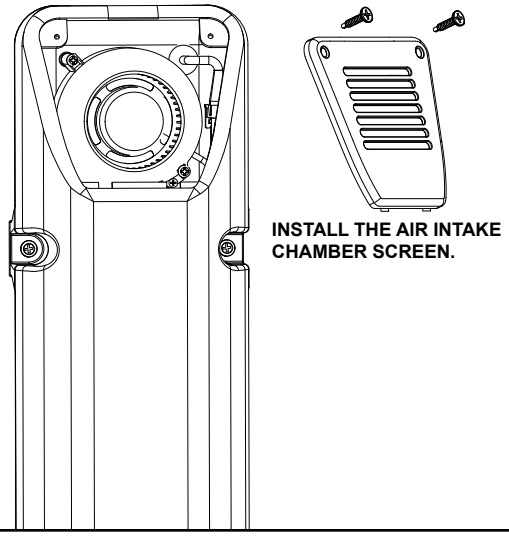


Figure 66.

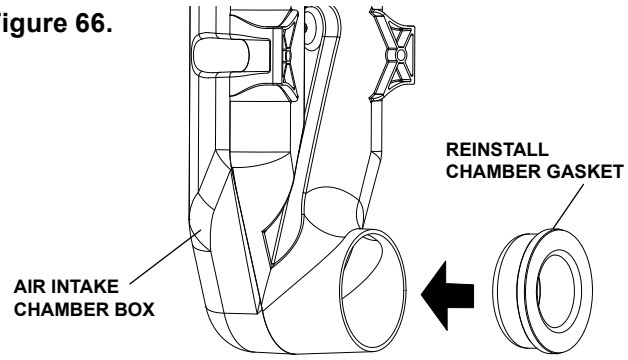
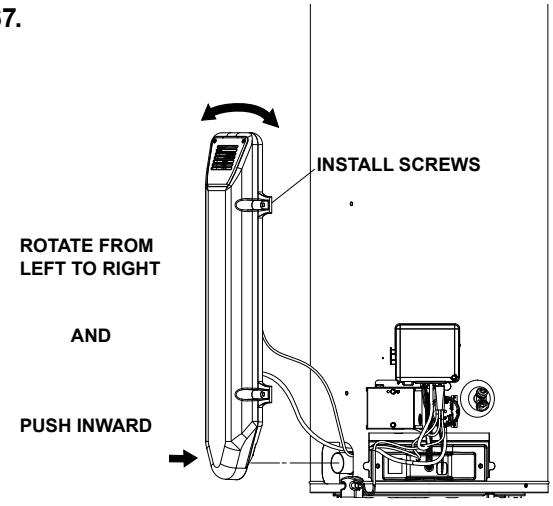


Figure 67.

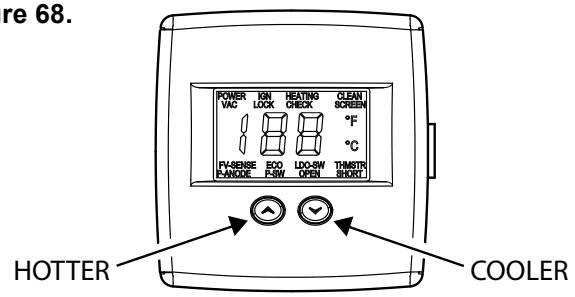


AIR INTAKE CHAMBER FAN REMOVAL / REPLACEMENT

Important: Use only factory authorized replacement parts. If you lack the necessary skills to properly perform the installation, you should not proceed, but get help from a qualified service technician.

Tools required: Phillips Head Screwdriver.

Figure 68.



Electronic Control Display

Figure 69.

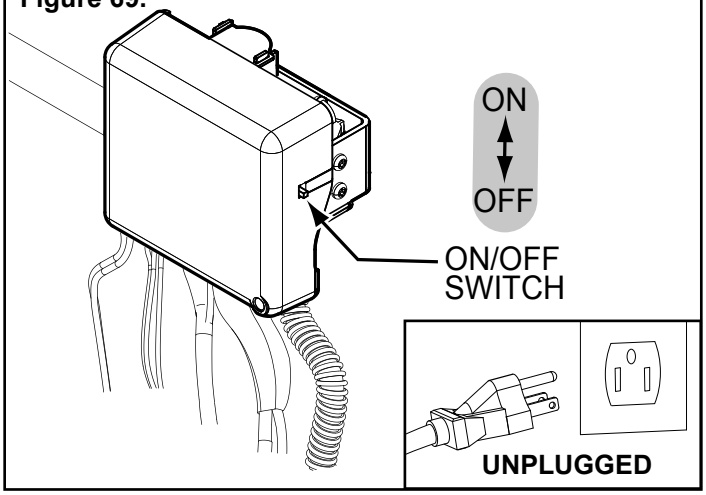
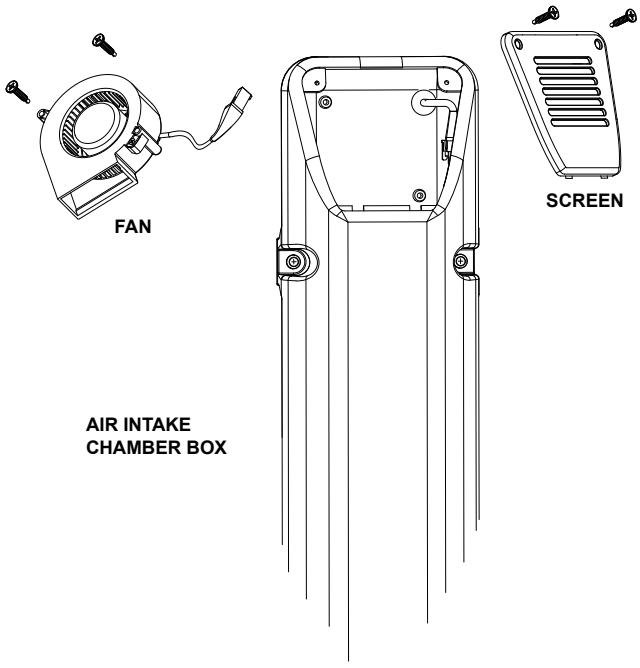


Figure 70.



Removing the Fan from the Air Intake Chamber:

1. Set the gas control valve/thermostat to its lowest setting by pressing the “COOLER” and “HOTTER” buttons together at the same time holding for 1 second. Then press the “COOLER” button to the lowest setting (Figure 68).
2. Turn gas control switch to the “OFF” position (located right side of the gas control valve/ thermostat) and turn off the gas supply to the unit (Figure 69).
3. Disconnect the electric connection by unplugging the transformer from the wall outlet (Figure 69).
4. Using a phillips head screwdriver, remove the two (2) screws at the air intake chamber screen (Note: save screws for reinstallation later) (Figure 70).
5. Remove the air intake chamber screen by lifting upward (Figure 70).
6. Take note of the wire position routing around the fan inside of the air intake chamber as this wire positioning will need to be duplicated upon installation of the new fan inside the intake chamber box.
7. Remove the 2 screws securing the old fan inside the chamber (Note: save these screws for reinstallation later) (Figure 70).
8. Lift the old fan up and outward to remove from the air intake chamber (Figure 70).
9. Locate the male to female electrical connection with close pin lock on wiring harness (the white connection approximately 12” from fan).
10. To separate the electrical connection of the fan and wiring harness: press down on the back portion of the close pin lock of the electrical connection while pulling the connection in the opposite directions.

Installing the Fan in the Air Intake Chamber Box:

11. Plug the electrical connections of the new fan into the wiring harness: Align the electrical connections in such a position as to ensure the locking portions of the connections are on the same side. Gently push the electrical connectors together until the snap lock on the wiring harness engages the angular lock on the fan connector. **Do Not** use undue force in pushing these connectors together (Figure 71). (Note: Connectors are designed in such a manner if the connection is not properly aligned they will not lock together).
12. Place the new fan inside the air intake chamber box. It is imperative that the square portion of the fan air outlet be placed inside the raised square portion of the air intake chamber of the fan compartment (Figure 72).
13. Ensuring the new fan is properly aligned in the air intake chamber, secure the fan in place using the 2 screws removed in step 7 (Figure 72).
14. Route the wiring inside the fan box to the outer edge of the fan in such a manner to ensure it will not be pinched or damaged upon installation of the air intake screen (Figure 72).
15. Install the air intake chamber screen, ensuring that the prongs of the lower portion of the air intake chamber screen are in place in the holding slots. Using the 2 screws removed in step 4, secure the air intake chamber screen (Figure 73).
16. Turn on the electrical and the gas supplies to the water heater. Plug in the electric connection from the transformer to the electric outlet (Figure 69).
17. Restart the water heater by following the directions on the “Lighting and Operating Instructions” label located on the front of the water heater.
18. Upon verifying proper operation of the water heater, replace the manifold cover/outer door.

Figure 71.

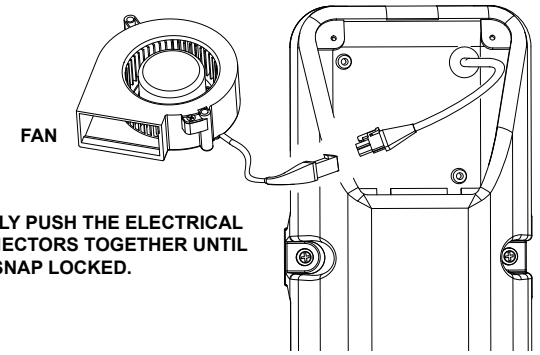


Figure 72.

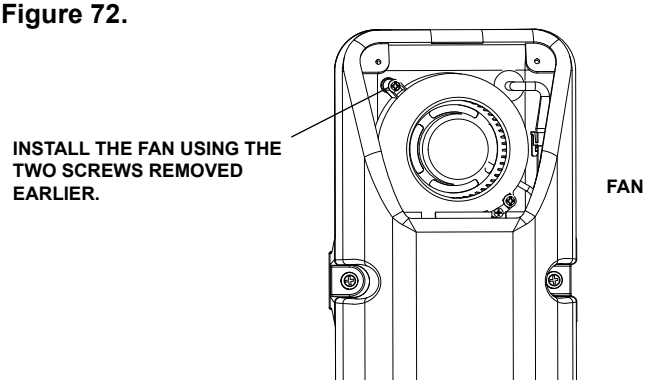
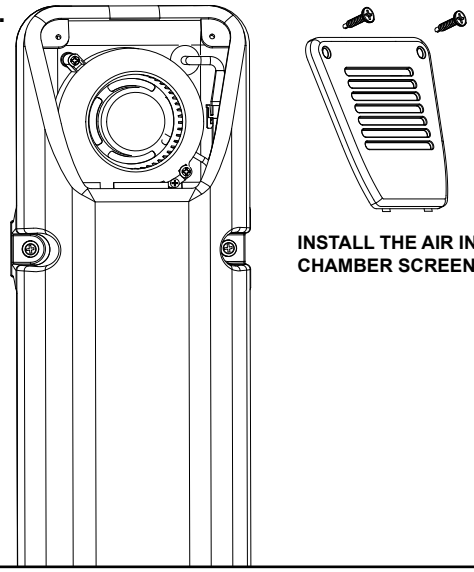


Figure 73.

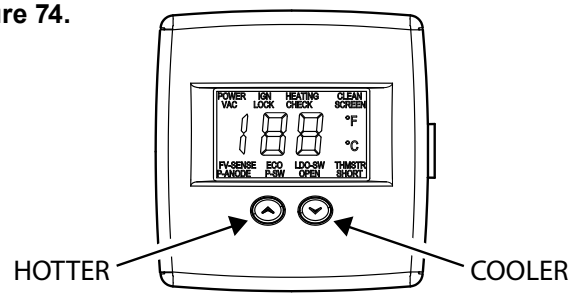


PRESSURE TUBING REMOVAL / REPLACEMENT

Important: Use only factory authorized replacement parts. If you lack the necessary skills to properly perform the installation, you should not proceed, but get help from a qualified service technician.

Tools required: Phillips Head Screwdriver.

Figure 74.



Electronic Control Display

Removing the Air Intake Chamber Box:

1. Set the gas control valve/thermostat to its lowest setting by pressing the “COOLER” and “HOTTER” buttons together at the same time holding for 1 second. Then press the “COOLER” button to the lowest setting (Figure 74).
2. Turn gas control switch to the “OFF” position (located right side of the gas control valve/ thermostat) and turn off the gas supply to the unit (Figure 75).
3. Disconnect the electric connection by unplugging the transformer from the wall outlet (Figure 75).
4. Remove the manifold cover/ outer door from the unit by depressing on the lower portion and pulling outward.
5. Remove the air pressure tubing from the air pressure switch by pulling downward on the tubing at the connection to the air pressure switch (Figure 76).
6. Using a phillips head screwdriver, remove the 4 screws securing the air intake chamber box to the water heater’s side (Note: keep these screws in a safe place for reinstallation later) (Figure 77).
7. Rotate the top of the air intake chamber box from left to right (only a few inches in both directions) while pulling outward at the bottom removing the air intake chamber box from the combustion chamber pipe saving the air intake chamber gasket for reinstallation (Figure 77).
8. Upon removal of the air intake chamber box, locate the air pressure tubing at the back of the air intake chamber box and unplug the tubing. Note the routing of the air pressure tubing through the water heater’s opening near the bottom. Remove the old air pressure tubing (Figures 76 & 77).
9. Connect the new air pressure tubing into the back of the air intake chamber box by pushing it on the connector (Figure 78).
10. Route the new air pressure tubing through the water heater’s opening near the bottom (Note: mirrors the position of the old tubing) (Figures 77).

Figure 75.

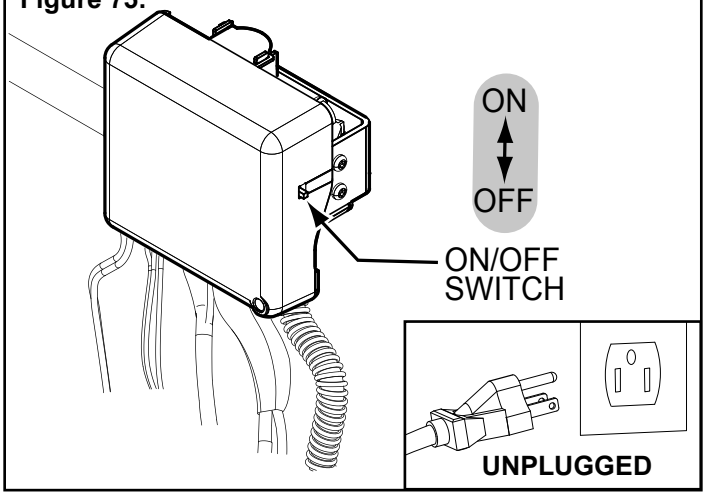


Figure 76.

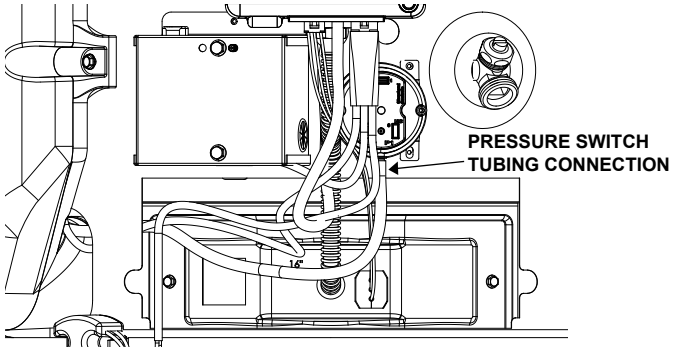
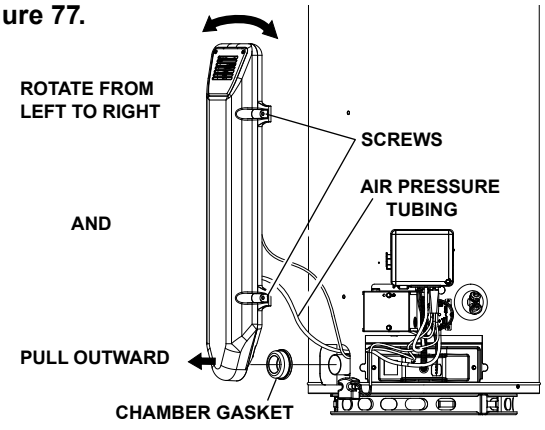


Figure 77.



Installing the Air Intake Chamber Box:

11. Check the position the wiring harness wire in the wiring channeling molded down the back center of the air intake chamber box (Figure 78).
12. Connect the air pressure tubing to the fitting on the bottom of the air intake chamber box and route tubing in molded inlaid of the air intake chamber box (Figure 78).
13. Reinstall the air intake chamber gasket (removed in step 7) on the back lower portion of the air intake chamber box (Figure 79).
14. Install the air intake chamber box to the combustion chamber pipe. Using a small amount of soapy water will help. **Do not** get any water or soapy water on any electrical connections or gas control components (see Figure 80), **(NOTE: UNDUE PRESSURE OR SUDDEN FORCE SUCH AS HAMMERING OR BEATING ON THE AIR CHAMBER BOX WITH ANY OBJECT INCLUDING YOUR HANDS WILL DAMAGE THE AIR INTAKE CHAMBER BOX AND RESULT IN FAILURE OF THE HEATER'S OPERATION).**
15. Install the air intake chamber box by rotating the top of the air intake chamber box from left to right (only a few inches in both directions) while pressing on the bottom portion of the air intake chamber box. When properly installed the air intake chamber box will be in place against the water heater's side aligning with the screw holes (Figure 80).
16. Secure the air intake chamber box to the water heater's side by reusing the 4 screws removed in step 6 (Figure 80).
17. Reattach the air pressure tubing to the air pressure switch by pushing the tubing onto the connector until the end of the tubing pushes to the shoulder of the connector.
18. Check the air hose tubing connection to the pressure switch to ensure the tubing has not loosened up or pulled off.
19. Turn on the electrical and the gas supplies to the water heater. Plug in the electric connection from the transformer to the electric outlet (Figure 75).
20. Restart the water heater by following the directions on the "Lighting and Operating Instructions" label located on the front of the water heater.
21. Upon verifying proper operation of the water heater, replace the manifold cover/outer door.

Figure 78.

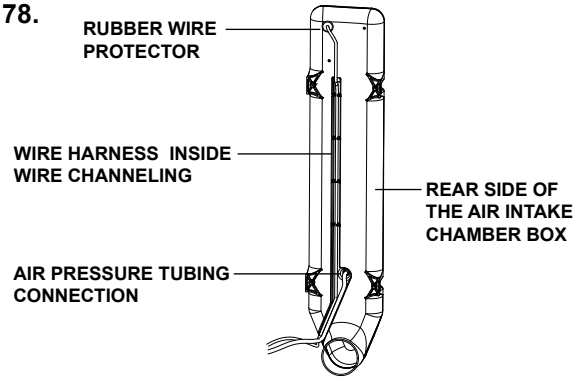

RUBBER WIRE PROTECTOR
WIRE HARNESS INSIDE WIRE CHANNELING
REAR SIDE OF THE AIR INTAKE CHAMBER BOX
AIR PRESSURE TUBING CONNECTION

Figure 79.

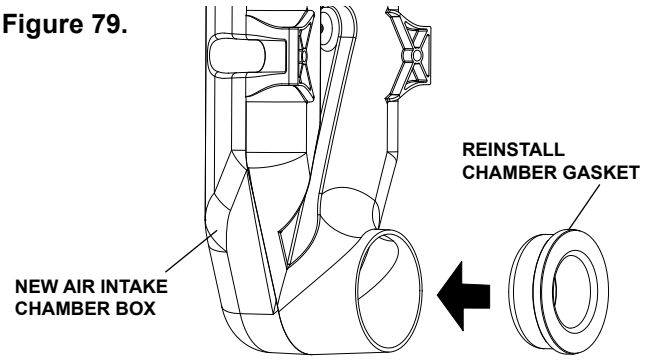
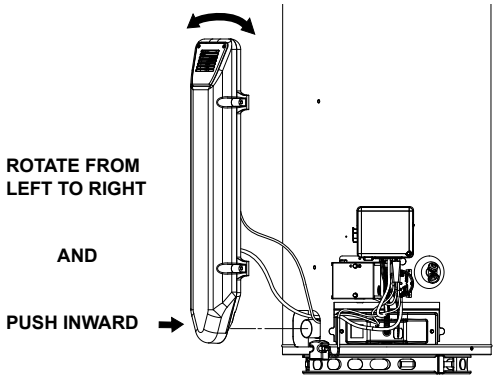


Figure 80.

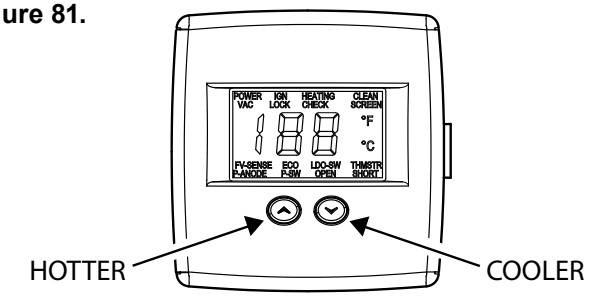


INNER DOOR/MANIFOLD/BURNER ASSEMBLY REMOVAL / REPLACEMENT

Important: Use only factory authorized replacement parts. If you lack the necessary skills to properly perform the installation, you should not proceed, but get help from a qualified service technician.

Tools required: 3/4" Open-End Wrench or Crescent Wrench, Phillips Head Screwdriver, Ratchet with 1/4" socket or 1/4" Nut Driver.

Figure 81.



Electronic Control Display

Figure 82.

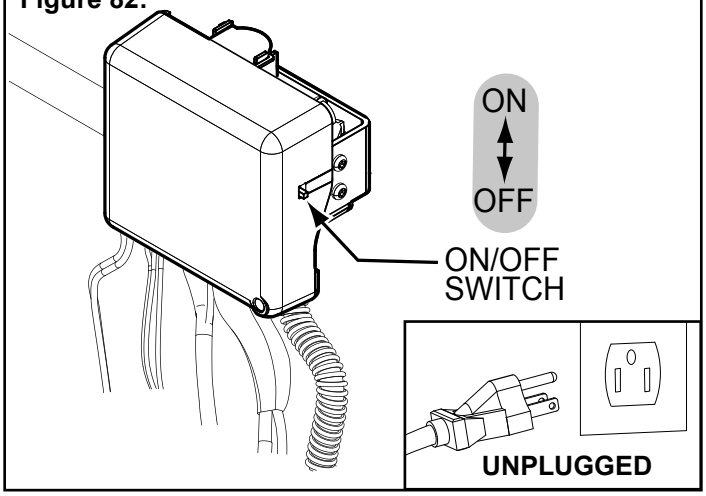


Figure 83.

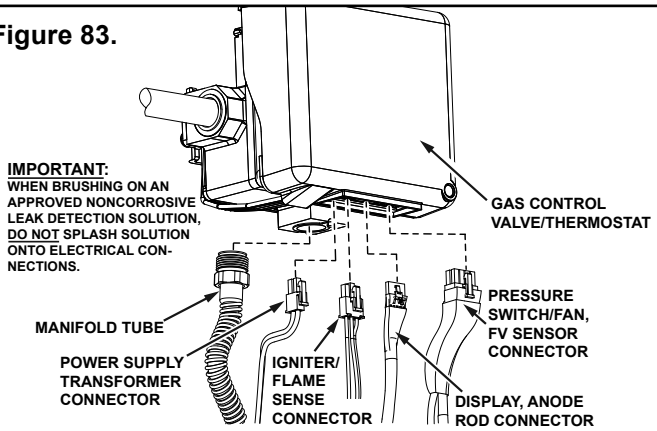
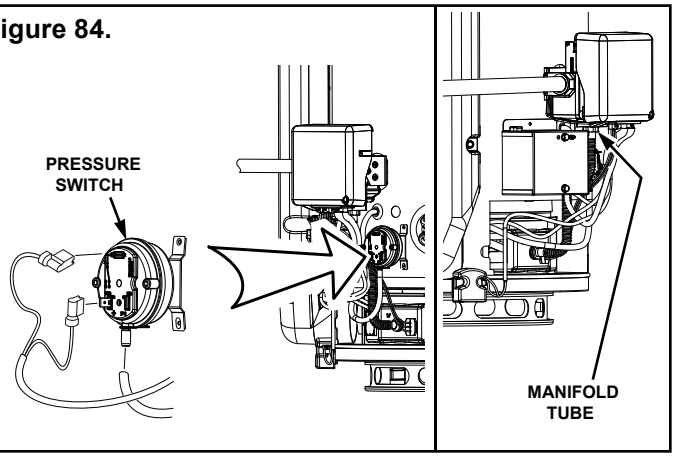

IMPORTANT:
WHEN BRUSHING ON AN APPROVED NONCORROSIVE LEAK DETECTION SOLUTION, DO NOT SPLASH SOLUTION ONTO ELECTRICAL CONNECTIONS.
GAS CONTROL VALVE/THERMOSTAT
MANIFOLD TUBE
POWER SUPPLY TRANSFORMER CONNECTOR
IGNITER/ FLAME SENSE CONNECTOR
PRESSURE SWITCH/FAN, FV SENSOR CONNECTOR
DISPLAY, ANODE ROD CONNECTOR

Figure 84.



Removing Old Inner Door/Manifold/Burner Assembly:

1. Set the gas control valve/thermostat to its lowest setting by pressing the "COOLER" and "HOTTER" buttons together at the same time holding for 1 second. Then press the "COOLER" button to the lowest setting (Figure 81).
2. Turn gas control switch to the "OFF" position (located right side of the gas control valve/ thermostat) and turn off the gas supply to the unit (Figure 82).
3. Disconnect the electric connection by unplugging the transformer from the wall outlet (Figure 82).
4. Remove the manifold cover/ outer door from the unit by depressing on the lower portion and pulling outward.
5. Unplug all the electrical connections from the bottom of the gas control valve/thermostat (Figure 83).
6. Disconnect the electrical flag terminals and air pressure tubing to the pressure switch (Figure 84).
7. Using a 3/4" open end wrench or a crescent wrench remove the manifold tube from the gas control valve/thermostat (turning counterclockwise -natural gas). Grasp the manifold tube and push down slightly to free the manifold tube from the gas control valve/thermostat (Figure 83).
8. Use a 1/4" nut driver or 1/4" socket & ratchet to loosen the 2 hex head screws on the inner door so the inner door/manifold/burner assembly can be removed (Figure 85).
9. Remove inner door/manifold/burner assembly by grasping the manifold and pulling straight back. Care should be taken when inner door and burner assembly passes through jacket opening that it does not damage any of the electrical wiring or the air pressure hose (Figure 86).

Installation Caution Must Be Taken:

10. Prior to installing the new inner door/manifold/ burner assembly, look inside the burner chamber to fully understand the correct positioning of the burner assembly and burner manifold tab. It may be necessary to use a flashlight to ensure correct placement. Care must be taken so as to not damage any electrical wiring, components or the air pressure tubing as you are installing the new inner door/manifold/burner assembly.

    Extra caution should be taken to ensure that electrical wiring, air hose, fiberglass insulation nor any other object is between door gasket and combustion chamber shield.

Installing New Inner Door/Manifold/Burner Assembly

11. Insert the manifold/burner assembly in the burner chamber compartment, making sure that the tip of burner manifold tab engages in the slot of the bracket (Figure 86).

    The tip end of the burner manifold MUST be placed in the slotted portion under the condensation pan to obtain proper installation (Figure 86).

12. After confirming no material of any type are between door gasket and combustion chamber shield, align the screws on the inner door with the screw holes on the combustion chamber and tighten with 1/4" nut driver or 1/4" socket & ratchet (Figure 85). **After tightening the inner door screws, visually inspect area around door gasket and skirt for spaces or gaps. The door gasket MUST be sealed completely in order for the water heater to perform properly. DO NOT OPERATE THE WATER HEATER IF THE DOOR GASKET DOES NOT CREATE A SEAL BETWEEN MANIFOLD DOOR AND COMBUSTION CHAMBER.**
13. Reconnect the manifold tube to the gas control valve/thermostat (Note: **Do Not** apply any thread sealant at this connection). To prevent any cross threading the manifold tube should be started by hand (turn clockwise -natural gas). Upon tightening with the fingers and confirming it has not been cross threaded, tighten nut with an 3/4" open end wrench or crescent wrench (Figure 87).
14. Reconnect all the electrical connections to the bottom of the gas control valve/thermostat, gently pushing each connector up snapping into place (Figure 87).
15. Reconnect the electrical flag terminals and air pressure tubing to pressure switch (Figure 88).
16. Turn on the electrical and the gas supplies to the water heater. Plug in the electric connection from the transformer to the electric outlet (Figure 82).
17. Restart the water heater by following the directions on the "Lighting and Operating Instructions" label located on the front of the water heater. Test gas connections by brushing on an approved nonconcorrosive leak detection solution.
18. Upon verifying proper operation of the water heater, replace the manifold cover/outer door.

Figure 85.

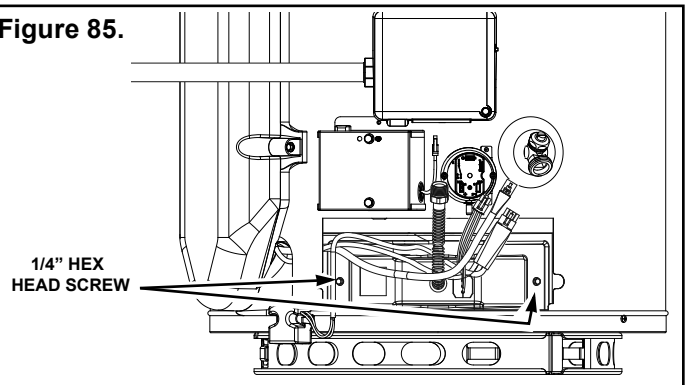


Figure 86.

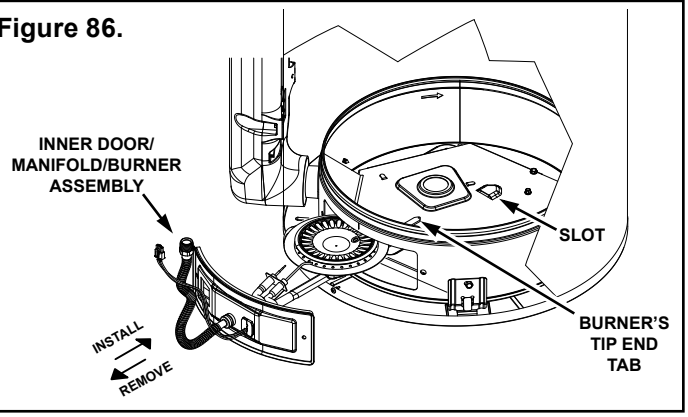


Figure 87.

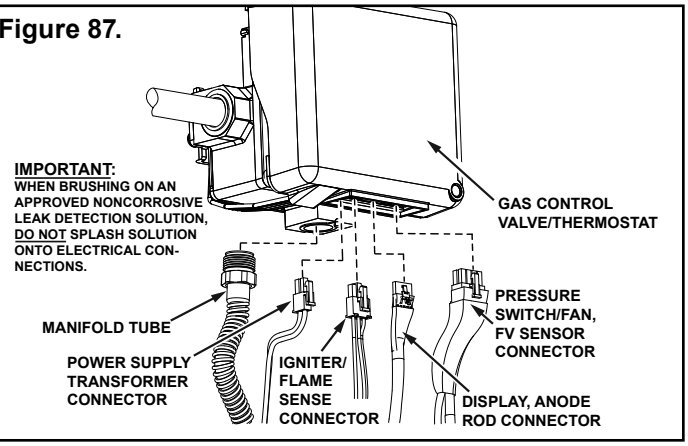
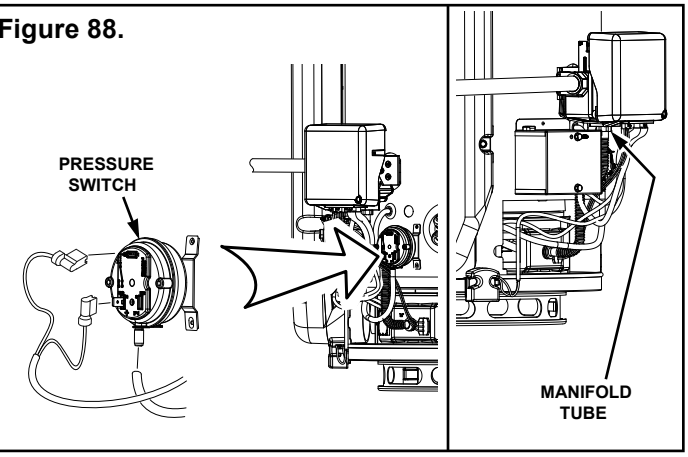


Figure 88.



FLAME SENSE/HOT SURFACE IGNITER REMOVAL / REPLACEMENT

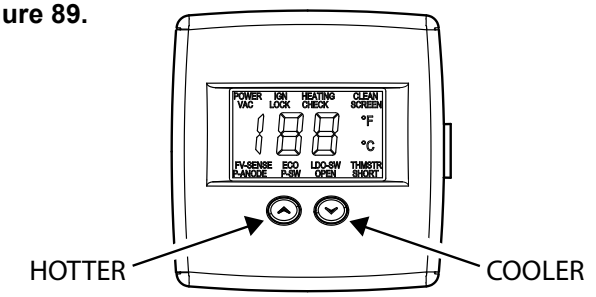
Important: Use only factory authorized replacement parts. If you lack the necessary skills to properly perform the installation, you should not proceed, but get help from a qualified service technician.

Tools required: 3/4” Open-End Wrench or Crescent Wrench, Phillips Head Screwdriver, Ratchet with 1/4” socket or 1/4” Nut Driver.

Replacing the Flame Sense/Hot Surface Igniter Assembly:

1. Set the gas control valve/thermostat to its lowest setting by pressing the “COOLER” and “HOTTER” buttons together at the same time holding for 1 second. Then press the “COOLER” button to the lowest setting (Figure 89).
2. Turn gas control switch to the “OFF” position (located right side of the gas control valve/ thermostat) and turn off the gas supply to the unit (Figure 90).
3. Disconnect the electric connection by unplugging the transformer from the wall outlet (Figure 90).
4. Remove the manifold cover/ outer door from the unit by depressing on the lower portion and pulling outward.
5. Remove the inner door/manifold/burner assembly. See Removing Inner Door/Manifold/Burner Assembly, (page 41) (Figure 91).
6. Lift the retainer clip straight up from the back of the manifold component block (using a flat-blade screwdriver), then remove the manifold component block from the manifold door (Figure 92).
7. Remove and keep the screw securing the flame sense/hot surface igniter assembly (Figure 92).
8. Remove and discard the old flame sense/hot surface igniter assembly.
9. Route the new flame sense/hot surface igniter connector wire through manifold/burner door opening as shown in figure 92. Secure the assembly to the bracket ussing screw removed earlier.
10. Reposition the manifold component block in the manifold door opening and secure it with the retainer clip.
11. Install inner door/manifold/burner assembly, (see page 42).
12. Restart the water heater by following the directions on the “Lighting and Operating Instructions” label located on the front of the water heater.
13. Upon verifying proper operation of the water heater, replace the manifold cover/outer door.

Figure 89.



Electronic Control Display

Figure 90.

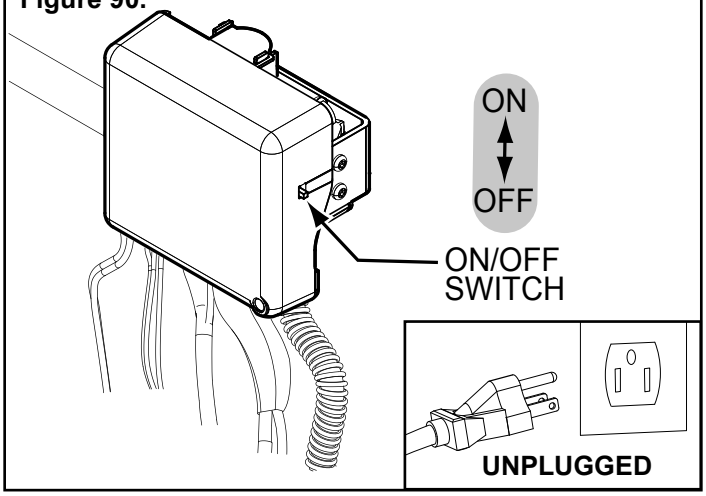


Figure 91

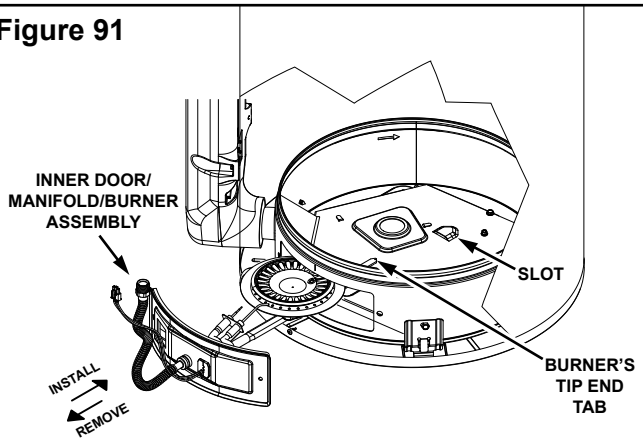
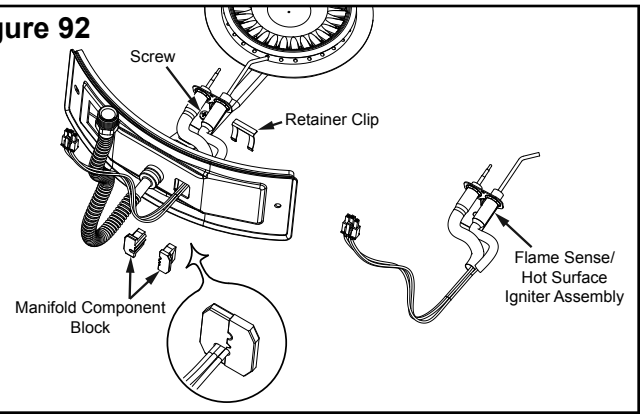


Figure 92



BURNER REMOVAL / REPLACEMENT

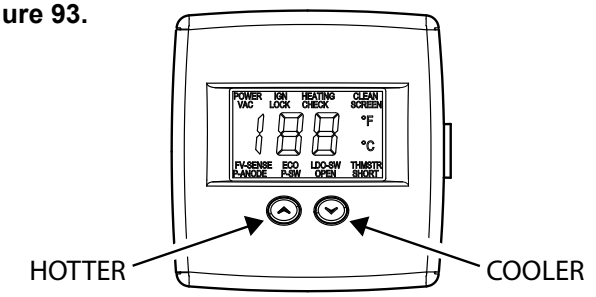
Important: Use only factory authorized replacement parts. If you lack the necessary skills to properly perform the installation, you should not proceed, but get help from a qualified service technician.

Tools required: 3/4" Open-End Wrench or Crescent Wrench, Phillips Head Screwdriver, Ratchet with 1/4" socket or 1/4" Nut Driver.

Removing the Inner Door/Manifold/Burner Assembly:

1. Set the gas control valve/thermostat to its lowest setting by pressing the "COOLER" and "HOTTER" buttons together at the same time holding for 1 second. Then press the "COOLER" button to the lowest setting (Figure 93).
2. Turn gas control switch to the "OFF" position (located right side of the gas control valve/ thermostat) and turn off the gas supply to the unit (Figure 94).
3. Disconnect the electric connection by unplugging the transformer from the wall outlet (Figure 94).
4. Remove the manifold cover/outer door from the unit by depressing on the lower portion and pulling outward.
5. Unplug all the electrical connections from the bottom of the gas control valve/thermostat (Figure 95).
6. Disconnect the electrical flag terminals and air pressure tubing to the pressure switch (Figure 96).
7. Using a 3/4" open end wrench or a crescent wrench remove the manifold tube from the gas control valve/thermostat (turning counterclockwise -natural gas). Grasp the manifold tube and push down slightly to free the manifold tube from the gas control valve/thermostat (Figure 95).
8. Use a 1/4" nut driver or 1/4" socket & ratchet to loosen the 2 hex head screws on the inner door so the inner door/manifold/burner assembly can be removed (Figure 97).
9. Remove inner door/manifold/burner assembly by grasping the manifold and pulling straight back. Care should be taken when inner door and burner assembly passes through jacket opening that it does not damage any of the electrical wiring or the air pressure hose (Figure 98).
10. Go to step 11.

Figure 93.



Electronic Control Display

Figure 94.

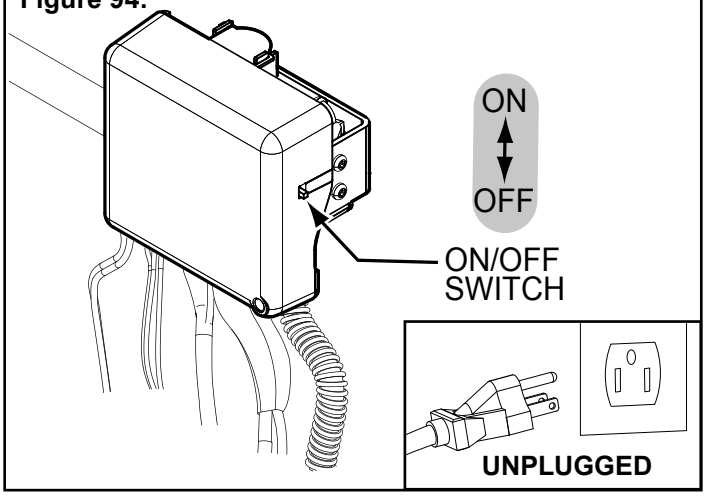
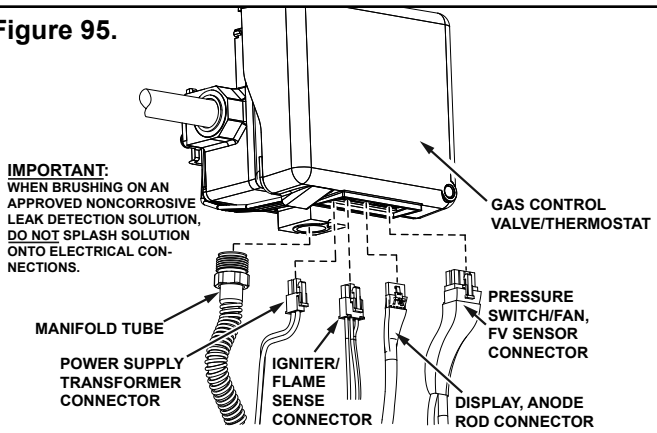


Figure 95.


IMPORTANT:
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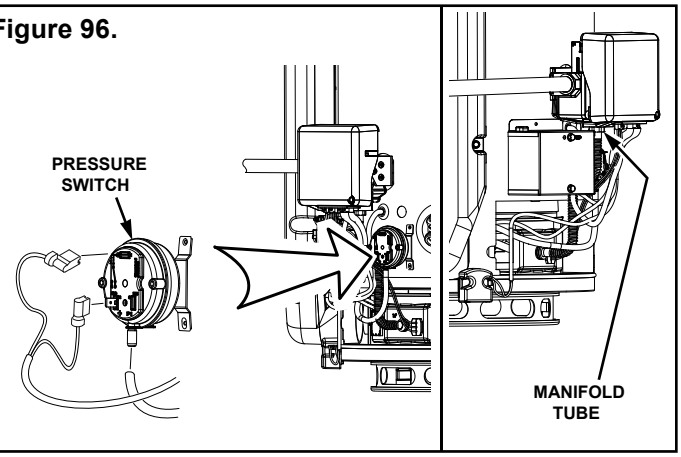
GAS CONTROL VALVE/THERMOSTAT
MANIFOLD TUBE
POWER SUPPLY TRANSFORMER CONNECTOR
IGNITER/ FLAME SENSE CONNECTOR
PRESSURE SWITCH/FAN, FV SENSOR CONNECTOR
DISPLAY, ANODE ROD CONNECTOR

Figure 96.



Removing Old Burner :

11. After noting the position of the condensation drain hole on the top of the burner. Turn the inner door/ manifold/burner assembly upside. Using a phillips head screwdriver remove the 2 screws attaching the burner to the manifold pipe (saving screws for reinstallation later) (Figure 99).

Installing New Burner :

12. Care MUST be taken to ensure the burner is installed correctly on the inner door/manifold assembly. Position the new burner upside down with the orientation of the burner's condensation drain as shown in illustration (Figure 99).
13. Align the screw holes on the inner door/manifold assembly. Using the two screws removed in step 11, installed the new burner to the inner door/ manifold assembly (rotate the assembly to visually check the top portion of the burner assembly and confirm the orientation of the condensation drain hole on the top of the burner is toward the back as shown in the illustration) (Figure 99).

Installation Caution Must Be Taken:

14. Prior to installing the new inner door/manifold/ burner assembly, look inside the burner chamber to fully understand the correct positioning of the burner assembly and burner manifold tab. It may be necessary to use a flashlight to ensure correct placement. Care must be taken so as to not damage any electrical wiring, components or the air pressure tubing as you are installing the new inner door/manifold/burner assembly.

    Extra caution should be taken to ensure that electrical wiring, air hose, fiberglass insulation nor any other object is between door gasket and combustion chamber shield.

Reinstalling The Inner Door/Manifold/Burner Assembly

15. Insert the manifold/burner assembly in the burner chamber compartment, making sure that the tip of burner manifold tab engages in the slot of the bracket (Figure 98).

    The tip end of the burner manifold MUST be placed in the slotted portion under the condensation pan to obtain proper installation (Figure 98).

Figure 97.

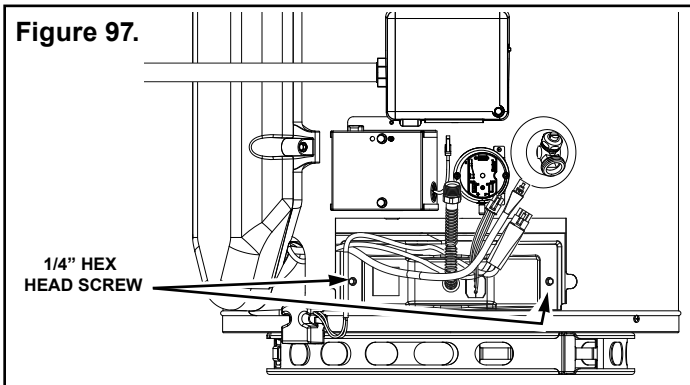


Figure 98.

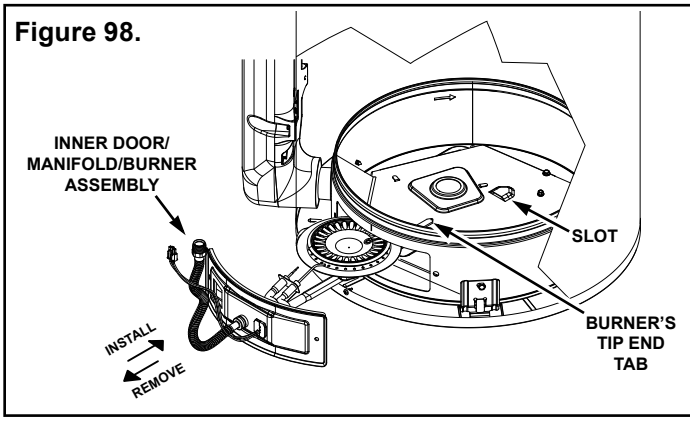


Figure 99.

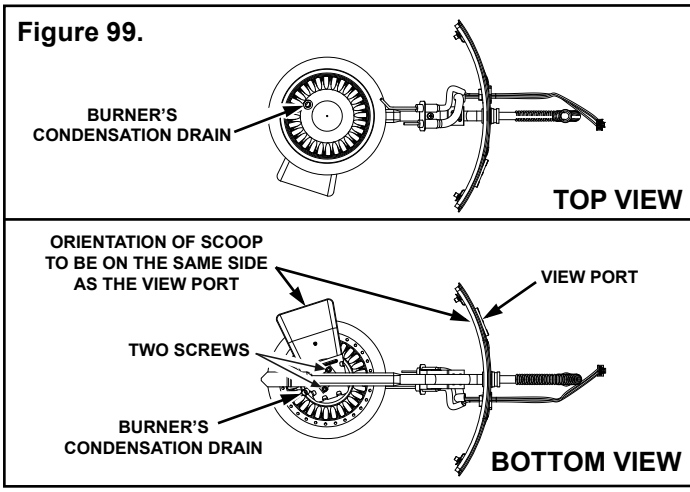
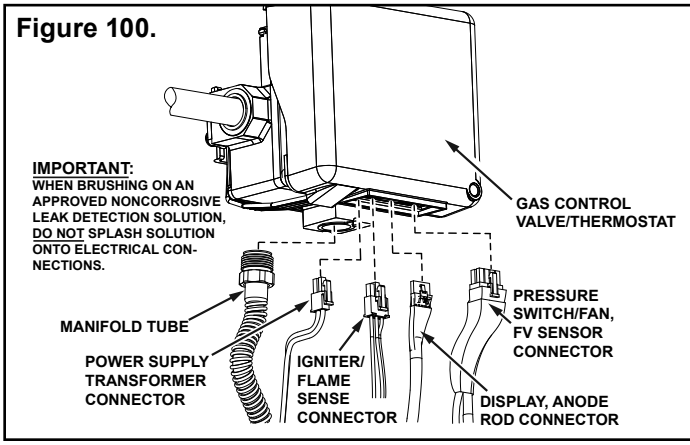
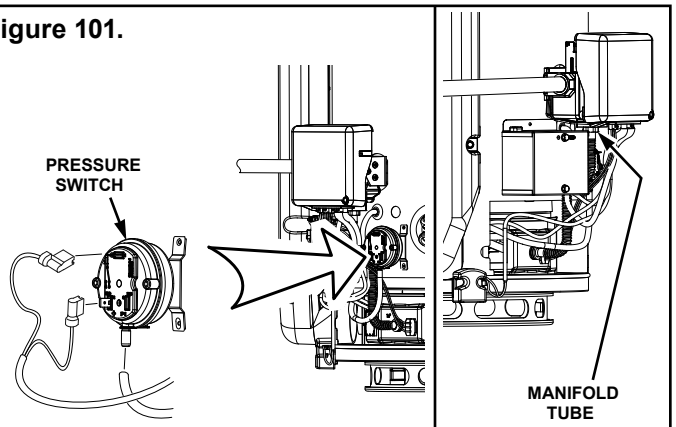


Figure 100.



16. After confirming no material of any type are between door gasket and combustion chamber shield, align the screws on the inner door with the screw holes on the combustion chamber and tighten with 1/4” nut driver or 1/4” socket & ratchet (Figure 97). **After tightening the inner door screws, visually inspect area around door gasket and skirt for spaces or gaps. The door gasket MUST be sealed completely in order for the water heater to perform properly. DO NOT OPERATE THE WATER HEATER IF THE DOOR GASKET DOES NOT CREATE A SEAL BETWEEN MANIFOLD DOOR AND COMBUSTION CHAMBER.**
17. Reconnect the manifold tube to the gas control valve/ thermostat (Note: **Do Not** apply any thread sealant at this connection). To prevent any cross threading the manifold tube should be started by hand (turn clockwise -natural gas). Upon tightening with the fingers and confirming it has not been cross threaded, tighten nut with an 3/4” open end wrench or crescent wrench (Figure 100).
18. Reconnect all the electrical connections to the bottom of the gas control valve/thermostat, gently pushing each connector up snapping into place (Figure 100).
19. Reconnect the electrical flag terminals and air pressure tubing to pressure switch (Figure 101).
20. Turn on the electrical and the gas supplies to the water heater. Plug in the electric connection from the transformer to the electric outlet (Figure 94).
21. Restart the water heater by following the directions on the “Lighting and Operating Instructions” label located on the front of the water heater.
22. As the burner is heating (view flames through viewport), test the manifold tube connection at the gas control valve/thermostat by brushing on an approved noncorrosive leak detection solution (**IMPORTANT: Do Not splash any solution onto any electrical connections**) (Figure 100).
23. Upon verifying proper operation of the water heater, replace the manifold cover/outer door.

Figure 101.

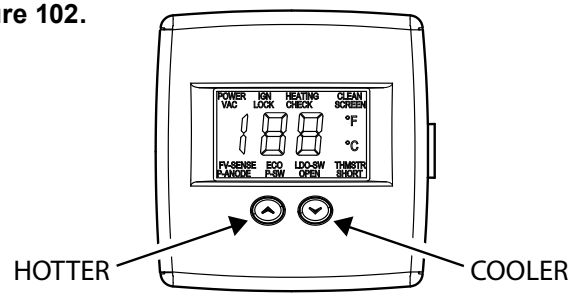


BURNER ORIFICE REMOVAL / REPLACEMENT

Important: Use only factory authorized replacement parts. If you lack the necessary skills to properly perform the installation, you should not proceed, but get help from a qualified service technician.

Tools required: 3/4" Open-End Wrench or Crescent Wrench, Phillips Head Screwdriver, Ratchet with 1/4" socket or 1/4" Nut Driver, Ratchet with 1/2" socket.

Figure 102.



Electronic Control Display

Removing the Inner Door/Manifold/Burner Assembly:

1. Set the gas control valve/thermostat to its lowest setting by pressing the "COOLER" and "HOTTER" buttons together at the same time holding for 1 second. Then press the "COOLER" button to the lowest setting (Figure 102).
2. Turn gas control switch to the "OFF" position (located right side of the gas control valve/ thermostat) and turn off the gas supply to the unit (Figure 103).
3. Disconnect the electric connection by unplugging the transformer from the wall outlet (Figure 103).
4. Remove the manifold cover/outer door from the unit by depressing on the lower portion and pulling outward.
5. Unplug all the electrical connections from the bottom of the gas control valve/thermostat (Figure 104).
6. Disconnect the electrical flag terminals and air pressure tubing to the pressure switch (Figure 105).
7. Using a 3/4" open end wrench or a crescent wrench remove the manifold tube from the gas control valve/thermostat (turning counterclockwise -natural gas). Grasp the manifold tube and push down slightly to free the manifold tube from the gas control valve/thermostat (Figure 104).
8. Use a 1/4" nut driver or 1/4" socket & ratchet to loosen the 2 hex head screws on the inner door so the inner door/manifold/burner assembly can be removed (Figure 106).
9. Remove inner door/manifold/burner assembly by grasping the manifold and pulling straight back. Care should be taken when inner door and burner assembly passes through jacket opening that it does not damage any of the electrical wiring or the air pressure hose (Figure 107).

Figure 103.

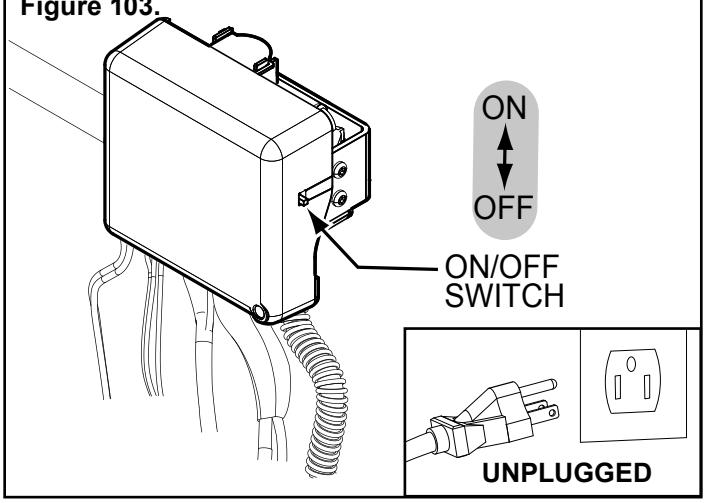
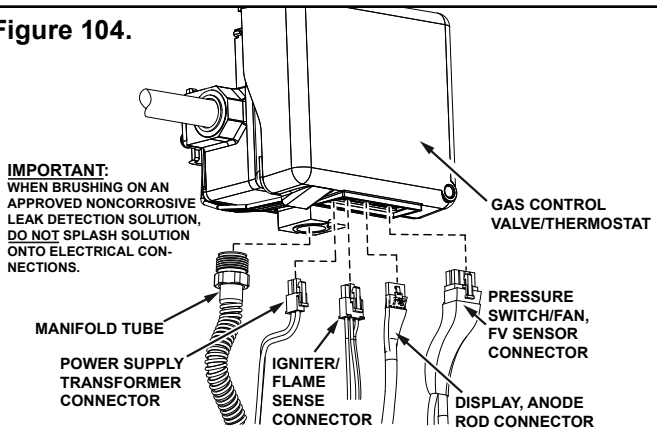


Figure 104.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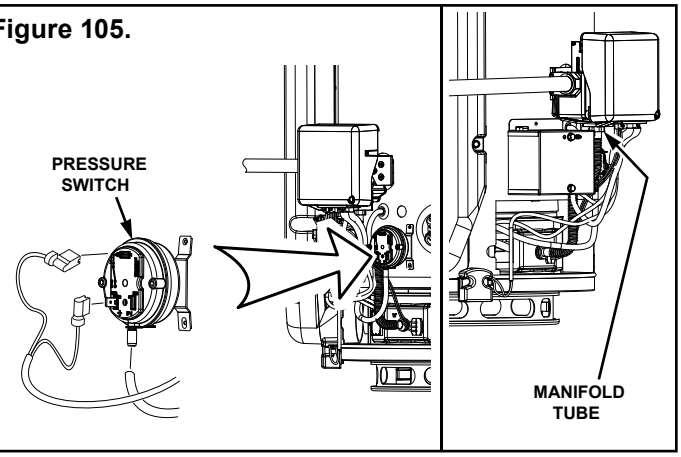
GAS CONTROL VALVE/THERMOSTAT
MANIFOLD TUBE
POWER SUPPLY TRANSFORMER CONNECTOR
IGNITER/ FLAME SENSE CONNECTOR
PRESSURE SWITCH/FAN, FV SENSOR CONNECTOR
DISPLAY, ANODE ROD CONNECTOR

Figure 105.



Removing Old Burner Orifice :

11. Burner may be hot, wait until burner has cooled off. After noting the position of the condensation drain hole on the top of the burner. Turn the inner door/manifold/burner assembly upside. Using a phillips head screwdriver remove the 2 screws attaching the burner to the manifold pipe (saving screws for reinstallation later) (Figure 108).
12. Using a ratchet with 1/2" socket, remove the burner's old orifice (Note: the burner orifices have different threads dependent upon the gas type. Right handed treads for natural gas (Figure 109).

Installing New Burner Orifice :

13. Using a ratchet with 1/2" socket, install the new burner orifice (Note: the burner orifices have different threads dependent upon the gas type. Right handed treads for natural gas (turn clockwise to install) and Left handed threads for propane gas (turn counterclockwise to install) (Figure 109).
14. Care MUST be taken to ensure the burner is installed correctly on the inner door/manifold assembly. Position the new burner upside down with the orientation of the burner's condensation drain as shown in illustration (Figure 108).
15. Align the screw holes on the inner door/manifold assembly. Using the two screws removed in step 11, installed the new burner to the inner door/manifold assembly (rotate the assembly to visually check the top portion of the burner assembly and confirm the orientation of the condensation drain hole on the top of the burner is toward the back as shown in the illustration) (Figure 108).

Installation Caution Must Be Taken:

16. Prior to installing the new inner door/manifold/burner assembly, look inside the burner chamber to fully understand the correct positioning of the burner assembly and burner manifold tab (Figure 107). It may be necessary to use a flashlight to ensure correct placement. Care must be taken so as to not damage any electrical wiring, components or the air pressure tubing as you are installing the new inner door/manifold/burner assembly.

    Extra caution should be taken to ensure that electrical wiring, air hose, fiberglass insulation nor any other object is between door gasket and combustion chamber shield.

Figure 106.

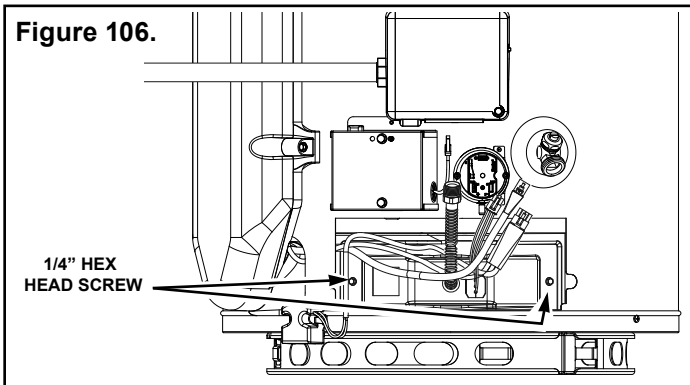


Figure 107.

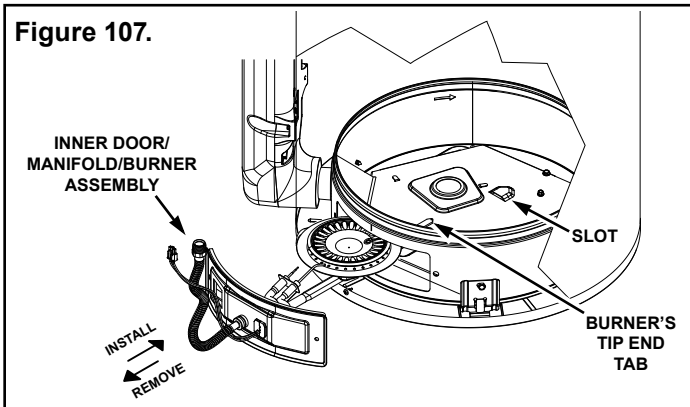


Figure 108.

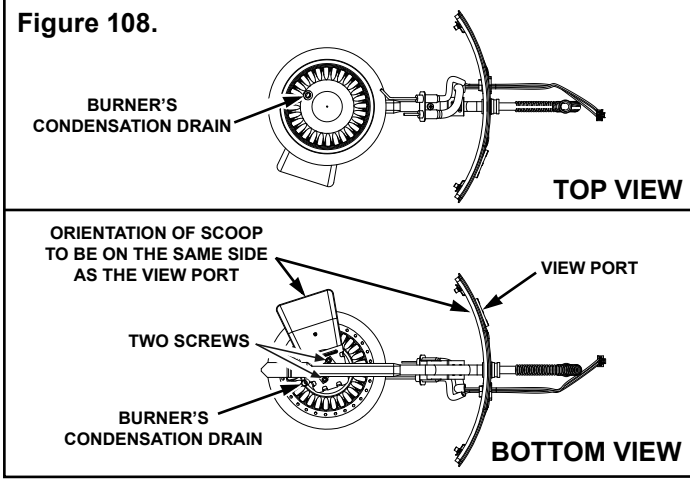
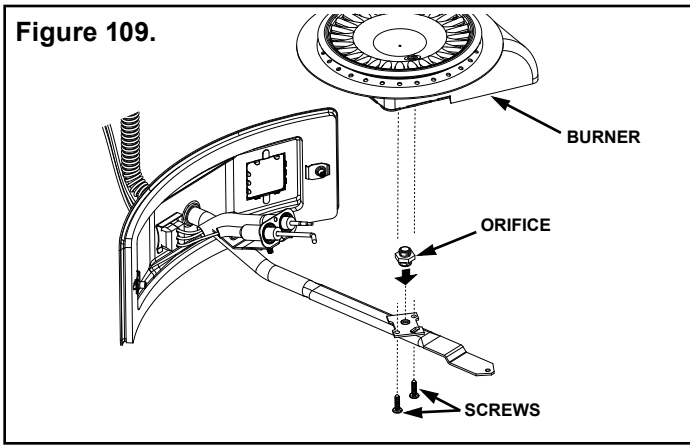


Figure 109.



Reinstalling The Inner Door/Manifold/Burner Assembly

17. Insert the manifold/burner assembly in the burner chamber compartment, making sure that the tip of burner manifold tab engages in the slot of the bracket (Figure 107).

    The tip end of the burner manifold MUST be placed in the slotted portion under the condensation pan to obtain proper installation (Figure 107).

18. After confirming no material of any type are between door gasket and combustion chamber shield, align the screws on the inner door with the screw holes on the combustion chamber and tighten with 1/4" nut driver or 1/4" socket & ratchet (Figure 106). **After tightening the inner door screws, visually inspect area around door gasket and skirt for spaces or gaps. The door gasket MUST be sealed completely in order for the water heater to perform properly. DO NOT OPERATE THE WATER HEATER IF THE DOOR GASKET DOES NOT CREATE A SEAL BETWEEN MANIFOLD DOOR AND COMBUSTION CHAMBER.**

19. Reconnect the manifold tube to the gas control valve/thermostat (Note: **Do Not** apply any thread sealant at this connection). To prevent any cross threading the manifold tube should be started by hand (turn clockwise -natural gas). Upon tightening with the fingers and confirming it has not been cross threaded, tighten nut with an 3/4" open end wrench or crescent wrench (Figure 110).

20. Reconnect all the electrical connections to the bottom of the gas control valve/thermostat, gently pushing each connector up snapping into place (Figure 110).

21. Reconnect the electrical flag terminals and air pressure tubing to pressure switch (Figure 111).

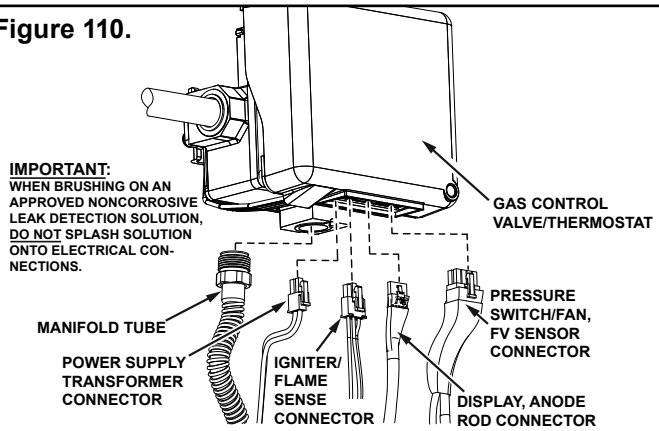
22. Turn on the electrical and the gas supplies to the water heater. Plug in the electric connection from the transformer to the electric outlet (Figure 103).

23. Restart the water heater by following the directions on the "Lighting and Operating Instructions" label located on the front of the water heater.

24. As the burner is heating (view flames through viewport), test the manifold tube connection at the gas control valve/thermostat by brushing on an approved noncorrosive leak detection solution (**IMPORTANT: Do Not splash any solution onto any electrical connections**) (Figure 110).

25. Upon verifying proper operation of the water heater, replace the manifold cover/outer door.

Figure 110.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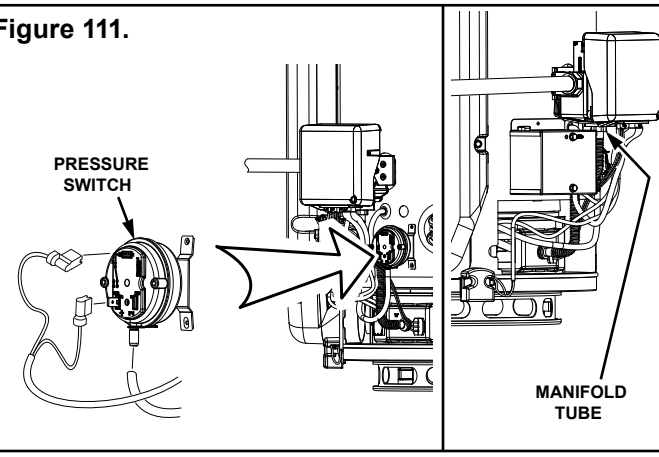
GAS CONTROL VALVE/THERMOSTAT
MANIFOLD TUBE
POWER SUPPLY TRANSFORMER CONNECTOR
IGNITER/ FLAME SENSE CONNECTOR
PRESSURE SWITCH/FAN, FV SENSOR CONNECTOR
DISPLAY, ANODE ROD CONNECTOR

Figure 111.



GAS CONTROL VALVE/THERMOSTAT REMOVAL / REPLACEMENT

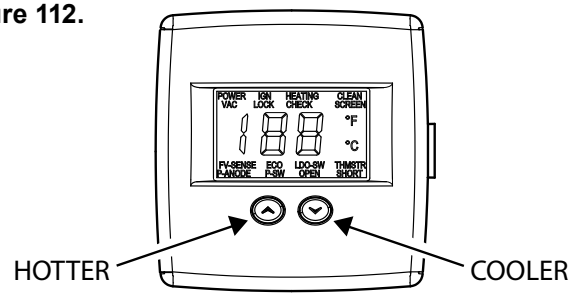
Important: Use only factory authorized replacement parts. If you lack the necessary skills to properly perform the installation, you should not proceed, but get help from a qualified service technician.

Tools required: 3/4" Open-End Wrench or Crescent Wrench, Phillips Head Screwdriver, a short length of 1/2" threaded Pipe.

Removing the Gas Control Valve/Thermostat:

1. Set the gas control valve/thermostat to its lowest setting by pressing the "COOLER" and "HOTTER" buttons together at the same time holding for 1 second. Then press the "COOLER" button to the lowest setting (Figure 112).
2. Turn gas control switch to the "OFF" position (located right side of the gas control valve/ thermostat) and turn off the gas supply to the unit (Figure 113).
3. Disconnect the electric connection by unplugging the transformer from the wall outlet (Figure 113).
4. Release water pressure by opening a nearby hot water faucet, let run until water is cool to touch. Turn off water supply to the water heater.
5. Remove the manifold cover/ outer door from the unit by depressing on the lower portion and pulling outward.
6. Connect a drain hose to the drain valve and run it to an adequate drain or to the exterior of the building. Open the water heater drain valve and allow the water to drain from the tank.
7. Unplug all the electrical connections from the bottom of the gas control valve/thermostat (Figure 114).
8. Using a 3/4" open end wrench or a crescent wrench remove the manifold tube from the gas control valve/thermostat (turning counterclockwise -natural gas). Grasp the manifold tube and push down slightly to free the manifold tube from the gas control valve/thermostat (Figure 114).
9. Using a phillips head screwdriver remove the transformer box from the front of the water heater by removing the one (1) screw at the top of the transformer box (save screw for reinstallation later) (Figure 115).
10. Disconnect the two (2) electrical flag connectors from the pressure switch, also disconnect the air pressure tubing. Using a phillips head screwdriver remove the pressure switch from the water heater's front by removing the two (2) screws securing it (save screws for reinstallation later) (Figure 115).

Figure 112.



Electronic Control Display

Figure 113.

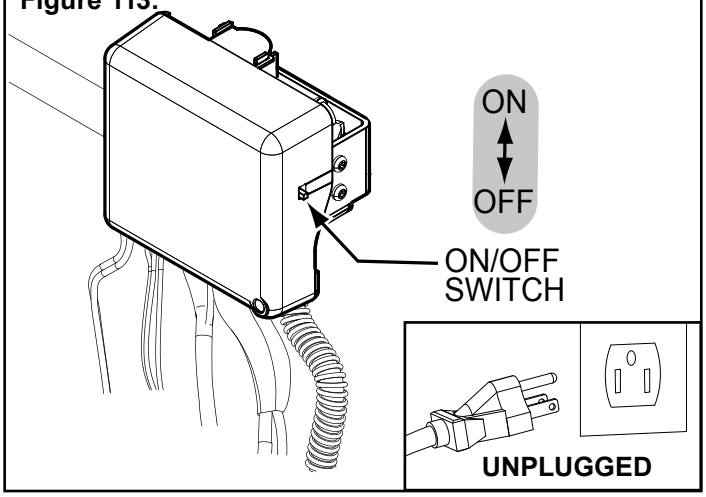
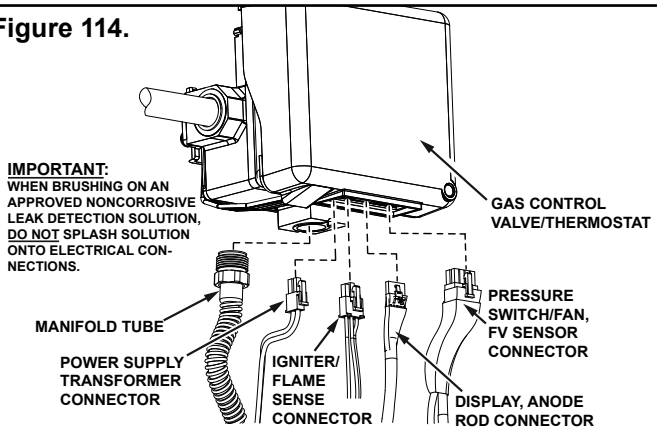


Figure 114.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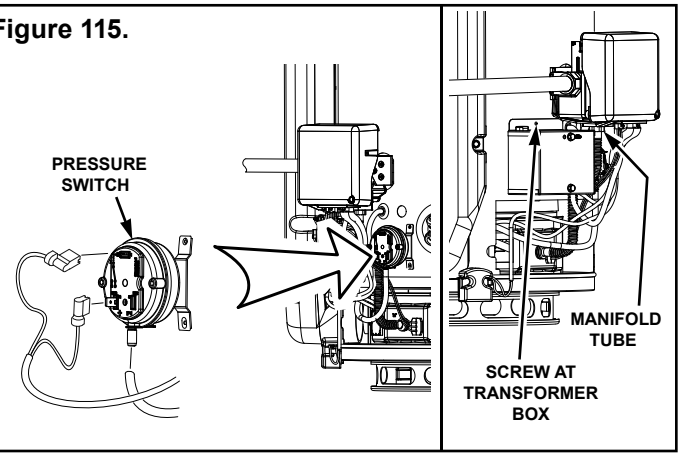
GAS CONTROL VALVE/THERMOSTAT
MANIFOLD TUBE
POWER SUPPLY TRANSFORMER CONNECTOR
IGNITER/ FLAME SENSE CONNECTOR
PRESSURE SWITCH/FAN, FV SENSOR CONNECTOR
DISPLAY, ANODE ROD CONNECTOR

Figure 115.



11. Ensuring that the gas supply line is turned off, disconnect the gas piping at the ground joint union, then remove the gas piping from the gas control valve/thermostat (Figure 116).
12. Remove any other fittings that may be installed on the threaded pipe to the gas control valve/thermostat (Figure 116).
13. After ensuring the water heater is completely drained, thread a short length of 1/2” threaded pipe into the inlet connection of the gas control valve/thermostat and use it to turn the gas control valve/thermostat counterclockwise to remove (Figure 117).

Installing the Gas Control Valve/Thermostat:

14. Before installing, apply Teflon® tape or an approved pipe sealant on the threads of the new gas control valve/thermostat (only the threads that screw into tank).
15. Thread a short length of 1/2” threaded pipe into the inlet connection of the new gas control valve/thermostat and use it to turn the gas control valve/thermostat clockwise to tighten into place (Note: **Do Not** over tighten or damage may result, but it needs to be water tight (Min. 35 foot pounds) (Figure 117).
16. Remove the 1/2” threaded pipe from the gas control valve/thermostat.
17. Reconnect the gas piping to the gas control valve/thermostat, use Teflon® tape or an approved pipe sealant on threads of the piping (Figure 116).
18. Close the drain valve and turn on the cold water supply line filling the tank completely with water. Purge the water lines of any excess air by opening a hot water faucet allowing the water to flow for a minimum of 3 minutes, allowing the tank to fill completely.
19. Using the two (2) phillips head screws removed earlier in step 10, reattach the air pressure switch (orientation with pressure tubing connector to the down side) to the front of the water heater. Reattach the electrical flag terminal to the pressure switch. Reattach the pressure tubing (Figure 118).
20. Reinstall the transformer box to the front of the water heater by using the one (1) phillips head screw removed earlier in step 9 (Figure 118).
21. Reconnect the manifold tube to the gas control valve/thermostat (Note: **Do Not** apply any thread sealant at this connection). To prevent any cross threading the manifold tube should be started by hand (turn clockwise -natural gas). Upon tightening with the fingers and confirming it has not been cross threaded, tighten nut with an 3/4” open end wrench or crescent wrench (Figure 119).
22. Reconnect all the electrical connections to the bottom of the gas control valve/thermostat, gently pushing each connector up snapping into place (Figure 119).

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Figure 116.

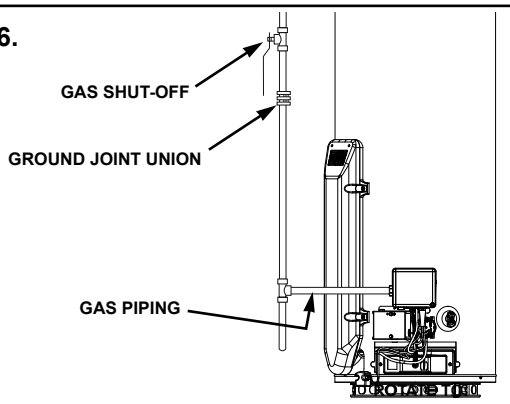


Figure 117.

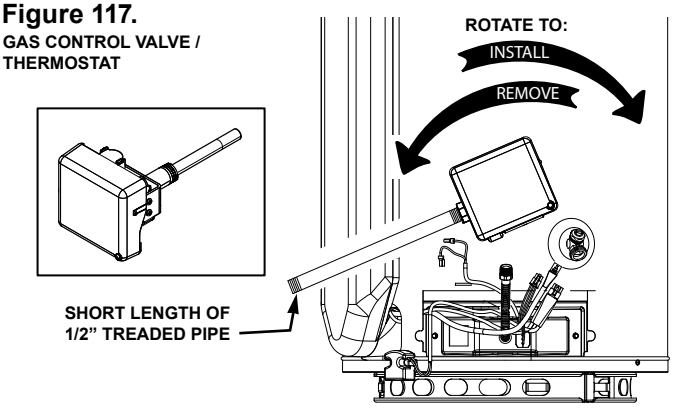


Figure 118.

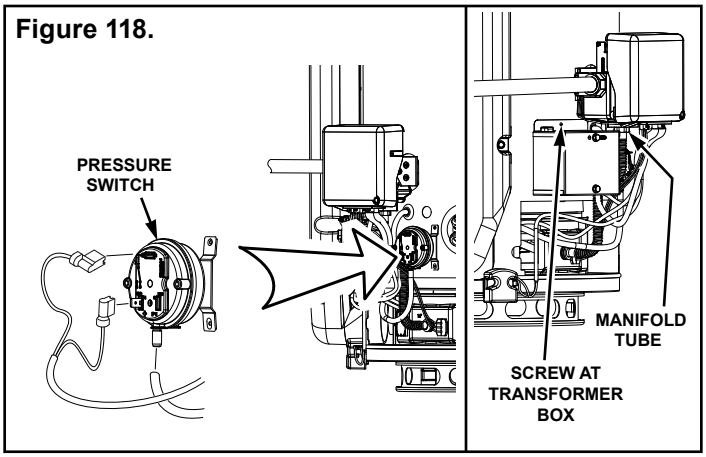
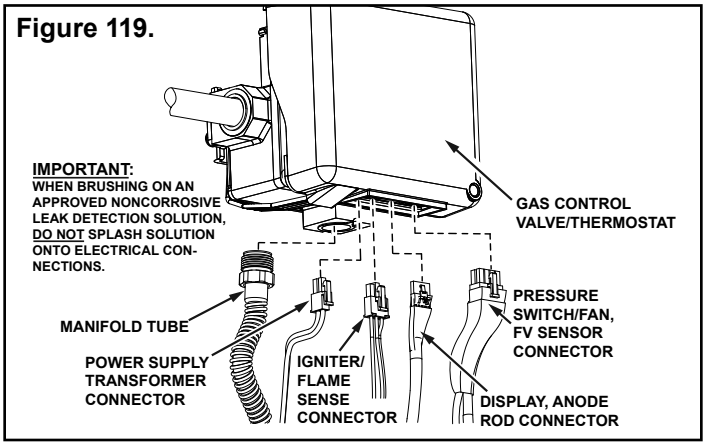


Figure 119.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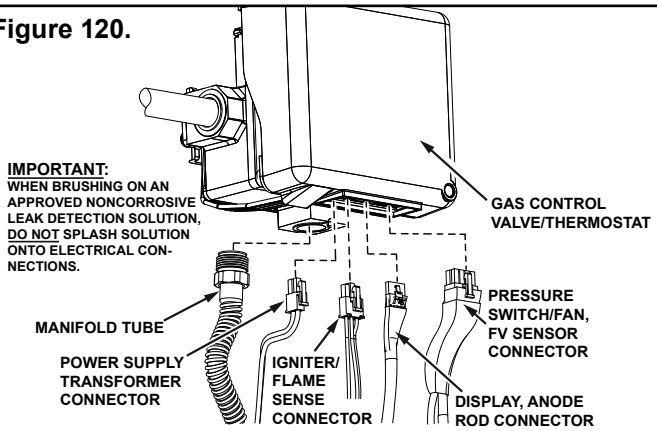
GAS CONTROL VALVE/THERMOSTAT
MANIFOLD TUBE
POWER SUPPLY TRANSFORMER CONNECTOR
IGNITER/ FLAME SENSE CONNECTOR
PRESSURE SWITCH/FAN, FV SENSOR CONNECTOR
DISPLAY, ANODE ROD CONNECTOR

23. Turn on the gas supply to the unit and test the gas supply line and union connections by brushing on an approved noncorrosive leak detection solution (Figure 116).
24. Turn on the electrical and the gas supplies to the water heater. Plug in the electric connection from the transformer to the electric outlet (Figure 113).
25. Restart the water heater by following the directions on the “Lighting and Operating Instructions” label located on the front of the water heater .
26. As the burner is heating (view flames through viewport), test the manifold tube connection at the gas control valve/thermostat by brushing on an approved noncorrosive leak detection solution (**IMPORTANT: Do Not splash any solution onto any electrical connections**) (Figure 120).
27. Upon verifying proper operation of the water heater, replace the manifold cover/outer door.

Figure 120.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CHECKING THE GAS SUPPLY PRESSURE

Checking the Gas Supply Pressure

Gas pressure checks are done with flowing gas using a gas pressure gauge capable of reading pressure in inches of water column.

- Supply gas pressure checks are measured before the gas control valve/thermostat and as close to the water heater as possible.
- Manifold (main burner) gas pressure is measured at the pressure tap on the side of the gas control valve/thermostat. Use an allen wrench to remove the plug then attach the gas gauge.

NOTE: Desired gas pressures will be noted on the gas valve label located on the gas control valve/thermostat.

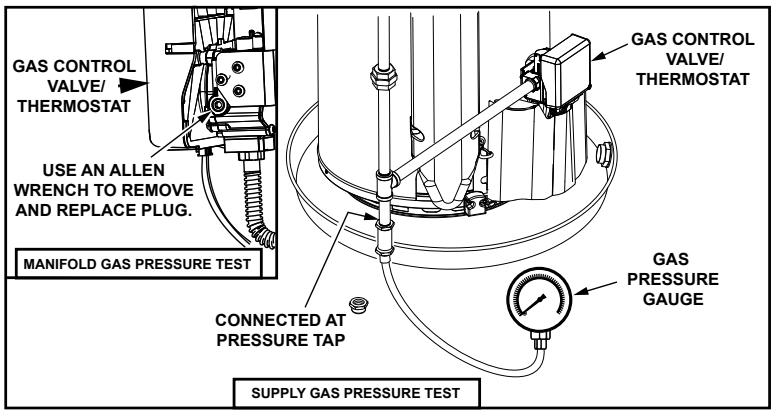
GAS CONTROL VALVE/ THERMOSTAT
USE AN ALLEN WRENCH TO REMOVE AND REPLACE PLUG.
MANIFOLD GAS PRESSURE TEST
GAS CONTROL VALVE/ THERMOSTAT
GAS PRESSURE GAUGE
CONNECTED AT PRESSURE TAP
SUPPLY GAS PRESSURE TEST

Figure 121

IF . . .	. . . THEN
supply gas pressure is under desired pressure requirement	• increase supply gas pressure regulator setting and, • increase supply gas piping size.
supply gas pressure is over desired pressure	• add gas pressure regulator. • reduce setting on existing regulator.
manifold gas pressure is more than +/- .3 inch W.C. from values indicated on gas valve	• ensure there is adequate supply gas pressure • ensure the main burner orifice is the correct size for the water heater model being tested. • if the above tests have been performed and the results were correct replace the gas control valve.

GAS WATER HEATER SIZING GUIDE

Use the following information as a guide to approximate the correct size water heater for the residence:

- 40 gallon size (28 gallon draw) for two bath residence -or one bath with an automatic clothes washer.
- 50 gallon size (35 gallon draw) for three bath residence - or two baths with an automatic clothes washer.
- When a whirlpool tub is part of the home equipment, it is suggested that the water heater storage tank capacity be selected based on the needs of the whirlpool tub. This method of tank sizing, will in most cases, cancel all statements above concerning tank sizing.
- High flow or multiple shower head installations must be sized for at least a 20 minute draw.

Table 2:								
Tub Capacity to Overflow Outlet at:	**80 gal.**	**90 gal.**	**100 gal.**	**110 gal.**	**120 gal.**	**130 gal.**	**140 gal.**	**150 gal.**
(120ºF Water) Min. Stored Water Capacity**	80 gal.	90 gal.	100 gal.	110 gal.	120 gal.	130 gal.	140 gal.	150 gal.
(140ºF Water*) Min. Stored Water Capacity**	65 gal.	71 gal.	80 gal.	89 gal.	98 gal.	108 gal.	117 gal.	125 gal.
(@ 160ºF Water*) Min. Stored Water Capacity**	54 gal.	59 gal.	66 gal.	74 gal.	82 gal.	90 gal.	97 gal.	104 gal.
*A thermostatic mixing valve set for a maximum temperature of 120° F is recommended to be installed to prevent a scalding hazard.								
**Based on tub water temperature of 105º								
Note: Because the desired fill time is normally 10 minutes, recovery capacity is not used for this calculation. All water used is supplied by storage.								
NOTE: The draw efficiency of a gas or electric water heater storage tank is considered to be 70%.								

LEAKAGE CHECKPOINTS

A. Water at the draft hood is water vapor which has condensed out of the combustion products. This is caused by a problem in the vent.

B. *Condensation may be seen on pipes in humid weather or pipe connections may be leaking.

C. *The powered anode rod fitting may be leaking.

D. Small amounts of water from temperature-pressure relief valve may be due to thermal expansion or high water pressure in your area.

E. *The temperature-pressure relief valve may be leaking at the tank fitting.

F. Water from a drain valve may be due to the valve being slightly opened.

G. *The drain valve may be leaking at the tank fitting.

H. Combustion products contain water vapor which can condense on the cooler surfaces of the tank. Droplets form and drip onto the burner or run on the floor. This is common at the time of start-up after installation and when incoming water is cold.

I. Water in the water heater bottom or on the floor may be from condensation, loose connections, or the relief valve. DO NOT replace the water heater until a full inspection of all possible water sources is made and necessary corrective steps taken.

Leakage from other appliances, water lines, or ground seepage should also be checked.

* To check where threaded portion enters tank, insert cotton swab between jacket opening and fitting. If cotton is wet, follow draining instructions in the “Draining the Water Heater” section and then remove fitting. Put pipe dope or Teflon® tape on the threads and replace. When you are finished, follow the steps in “Filling the Water Heater” section.

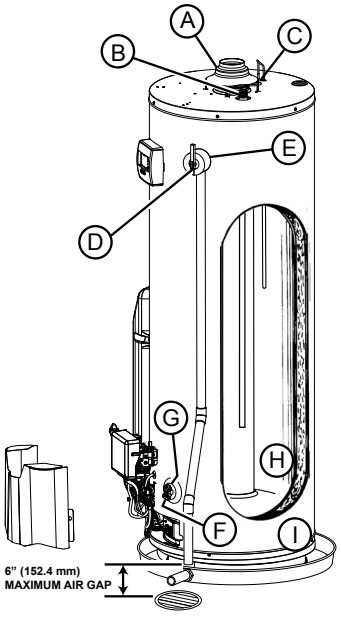

Figure 122

GENERAL INFORMATION

Draw efficiency is the quantity of hot water available to the consumer before the outlet water temperature decreases 25 degrees F. A 40 gallon water heater will typically provide 70% (28 gallons) of this "usable" hot water (60% is the minimum). The burner or elements are allowed to operate during this test. Incoming, cold water mixes the remaining stored water below this 25 degree limitation.

Energy Factor is an indicator of the combined thermal efficiency and standby efficiency of a water heater. The higher the energy factor, the more efficient the water heater will be.

Minerals and gases will separate from water as temperature increases.

"R" Value is a measure of the resistance of a substance to heat flow.

Recovery rate is the amount of water that is heated to a set temperature, per hour. An example might be that a water heater has a recovery rate of 30 gallons of water per hour at 80 degree F. (Fahrenheit) temperature rise.

Standby efficiency – the water heater's ability to contain heat in the tank. A minimum of tank water heat loss per hour is desired.

Sample: $\frac{\text{temperature change}}{\text{"R" value}}$ = Btu/h loss/ square foot of tank surface

Temperature rise is the increase in the temperature from its coldest "inlet" water temperature to the desired hot (outlet) setting. Typically this is assumed to be 40 degrees entering water, 120 degrees desired stored water or 80 degrees "temperature rise."

Thermal efficiency is approximately the amount of generated BTU (British Thermal Units), which enters the water. A percentage of the total BTU passes out through the vent piping.

Water cannot (for all practical purposes) be compressed.

Water expands when it is heated.

Formulas and Conversions:

BTU (British Thermal Unit) is the heat required to raise 1 pound of water 1°F

1 BTU = 252 cal = 0.252 kcal

1 cal = 4.187 Joules

BTU X 1.055 = Kilo Joules

BTU divided by 3,413 = Kilowatts

To convert from Fahrenheit to Centigrade: (° F – 32) times 5/9, or .556, equals degrees C.

One gallon of (120 ° F, 49 ° C) water weighs approximately 8.25 pounds.

Pounds X .45359 = Kilogram

Gallons X 3.7854 = Liters

% of Hot = (Mixed Temp. – Cold) divided by (Hot Temp. – Cold)

% Thermal Efficiency = (GPH X 8.25 X Temp. Rise X 1.0) divided by BTU/H Input

BTU Output = GPH X 8.25 X Temp. Rise X 1.0

GPH = (BTU/H Input X % Eff.) divided by (Temp. Rise X 8.25)

One cubic foot of Natural Gas contains about 1000 BTU of heat.

One "therm" is equal to 100,000 BTU

One cubic foot of Propane Gas contains about 2500 BTU of heat.

One gallon of Propane gas contains about 91,250 BTU of heat.

One pound of Propane gas contains about 21,600 BTU of heat.

GENERAL INFORMATION

One pound of **gas pressure** is equal to 27.7 inches water column pressure

Inches of Water Column X .036091 = PSI
Inches of Water Column X .073483 = Inches of Mercury (Hg.)

Centimeters = Inches X 2.54

MM (millimeters) =Inches X 25.4

Meters = Inches X .0254

Doubling the diameter of a pipe will increase its flow capacity (approximately) 5.3 times.

Construction: **Tank** is constructed of steel.

The inside of the tank is constructed of a glass lining bonded to the steel. This prevents water to metal contact and rusting of the tank.

An **anode rod** will be installed within the tank. The hex-head plug end of the anode is visible on the top of the water heater. This metal rod offers secondary protection of the tank against corrosion where the application of glass is not possible (threaded tank openings). These areas will have small areas of water to metal contact.

All water heaters will contain at least **one thermostat** (to operate the heater) and **one high limit** (to prevent water temperatures approaching the “steam” level).

ALL TECHNICAL AND WARRANTY QUESTIONS SHOULD BE DIRECTED TO THE LOCAL DEALER FROM WHOM THE WATER HEATER WAS PURCHASED. IF YOU ARE UNSUCCESSFUL, CONTACT A O SMITH WATER HEATERS RESIDENTIAL TECHNICAL ASSISTANCE AT 1-800-527-1953 OR WWW.HOTWATER.COM.